TECHNO INDIA UNIVERSITY

WEST BENGAL

Syllabus

for

4-Years B.Tech.

in

Computer Science and Engineering
(Specialization in Artificial Intelligence)

Academic Year: 2024-2025

Semester 3

MATHEMATICS-III (DISCRETE MATHEMATICS)
(TIU-UMA-T215)

Program: B. Tech. in CSE, CSE AI	**Year, Semester:** 2nd Yr., 3rd Sem.
Course Title: MATHEMATICS-III (DISCRETE MATHEMATICS)	**Subject Code:** TIU-UMA-T215
Contact Hours/Week: 3–0–0 (L–T–P)	**Credit:** 3

COURSE OBJECTIVE:

Enable the student to:

1. develop a foundation of set theory and concept of mathematical induction.
2. explore groups, rings and fields.
3. develop logical reasoning techniques and notation, demonstrate the application of logic to analyzing and writing proofs.
4. develop techniques for counting, permutations and combinations.
5. explore the concept of recurrence relations and generating functions and applications in algorithms.

COURSE OUTCOME:

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

CO-1:	Develop a foundation of set theory and concept of mathematical induction	K3
CO-2:	Analyse the concepts of a group with examples.	K4
CO-3:	Develop formal logical reasoning techniques and notation, demonstrate the application of logic to analyze and write proofs	K4
CO-4:	Construct techniques for counting, permutations and combinations.	K4
CO-5:	Apply the concept of recurrence relations and generating functions and applications in algorithms	K4
CO-6:	Examine if algebraic structures are rings or fields.	K4

COURSE CONTENT:

MODULE 1:	**Propositional logic**	**10 Hours**
Logical operators, propositional equivalences, normal forms, validity and satisfiability of arguments. Proof techniques: forward proof, proof by contradiction, contrapositive proofs, proof of necessity and sufficiency.		
MODULE 2:	**Sets, relations and functions**	**6 Hours**

Operations on sets, relations and functions, binary relations, partial ordering relations, equivalence relations, principles of mathematical induction. Size of a set: Finite and infinite sets, countable and uncountable sets.		
MODULE 3:	**Introduction to counting**	**10 Hours**
Basic counting techniques - inclusion and exclusion, pigeon-hole principle, permutation, combination, summations.		
MODULE 4:	**Recurrence**	**9 Hours**
Introduction to recurrence relation and generating function, Tower of Hanoi, Fibonacci Series. Derangement – Hatcheck Problem.		
MODULE 5:	**Algebraic structures and morphisms**	**10 Hours**
Algebraic structures with one binary operation - semigroups, monoids and groups, congruence relation and quotient structures. Free and cyclic monoids and groups, permutation groups, substructures, normal subgroups. Algebraic structures with two binary operations - rings, integral domains and fields.		
TOTAL LECTURES		**45 Hours**

Books:

1. Discrete Mathematics and Its Applications, K.H. Rosen.
2. Discrete Mathematics: An Open Introduction, O. Levin.

Environmental Science (TIU-UMB-T201)

Program: B. Tech in CSE-AI	**Year, Semester:** 2nd Yr., 3rd Sem
Course Title: Environmental Science	**Subject Code:** TIU-UMB-T201
Contact Hours/Week: 2–0–0(L–T–P)	**Credit:** 2

COURSE OBJECTIVE:

Enable the student to:

1. Understand the fundamentals of environmental pollution from chemical processes, including characterization of emissions and effluents, and relevant environmental regulations.
2. Apply pollution prevention strategies through process modification, resource recovery, and waste minimization techniques.
3. Analyze and design air and water pollution control systems, including particulate and gaseous emission control, and physical water treatment processes.
4. Evaluate and implement biological treatment methods for wastewater and appropriate solid waste disposal techniques.

COURSE OUTCOME:

The students will be able to:

CO-1:	Sources & types of pollution, industrial emissions & effluents, environmental laws & standards	K2
CO-2:	Pollution prevention, waste recovery & reuse, material & energy balance, water & emission control	K3
CO-3:	Selection & design of particulate and gaseous emission control systems, equipment performance analysis	K4
CO-4:	Wastewater treatment principles, solids removal processes (sedimentation, filtration, coagulation, etc.)	K4
CO-5:	Biological treatment principles, biochemical kinetics, aeration & sludge separation design	K4
CO-6:	Solid waste disposal methods, briquetting & gasification	K4

COURSE CONTENT:

MODULE 1:	**INTRODUCTION**	**6 Hours**
Environment and environmental pollution from chemical process industries, characterization of emission and effluents, environmental Laws and rules, standards for ambient air, noise emission and effluents.		
MODULE 2:	**POLLUTION PREVENTION**	**5 Hours**
Process modification, alternative raw material, recovery of by co-product from industrial emission effluents, recycle and reuse of waste, energy recovery and waste utilization. Material and energy balance for pollution minimization. Water use minimization, Fugitive emission/effluents and leakages and their control-housekeeping and maintenance.		
MODULE 3:	**AIR POLLUTION CONTROL**	**7 Hours**
Particulate emission control by mechanical separation and electrostatic precipitation, wet gas scrubbing, gaseous emission control by absorption and adsorption, Design of cyclones, ESP, fabric filters and absorbers		
MODULE 4:	**WATER POLLUTION CONTROL**	**6 Hours**
Physical treatment, pre-treatment, solids removal by setting and sedimentation, filtration centrifugation, coagulation and flocculation.		
MODULE 5:	**BIOLOGICAL TREATMENT**	**3 Hours**

Anaerobic and aerobic treatment biochemical kinetics, trickling filter, activated sludge and lagoons, aeration systems, sludge separation and drying.		
MODULE 6:	**SOLID DISPOSAL**	**3 Hours**
Solids waste disposal - composting, landfill, briquetting / gasification and incineration.		
	TOTAL LECTURES	**30 Hours**

Books:

1. A. K. De, "Environmental Chemistry", New Age
2. G. M. Masters, "Introduction to Environmental Engineering and Science", Pearson
3. 3. G. S. Sodhi, "Fundamental Concepts of Environmental Chemistry", Narosa
4. E. Odum, M. Barrick& G. W. Barrett, "Fundamentals of Ecology", Brooks

Digital Electronics (TIU-UEC-T211)

Program: B. Tech. in CSEAI	**Year, Semester:** 2nd Yr., 3rd Sem.
Course Title: Digital Electronics	**Subject Code:** TIU-UEC-T211
Contact Hours/Week: 3–1–0 (L–T–P)	**Credit:** 4

COURSE OBJECTIVE :

Enable the student to:

1. Understand number systems, arithmetic operations, conversions, binary codes, Boolean algebra, logic gates, minimization techniques, and logic families.
2. Analyze combinational circuits (adders, multiplexers, encoders, etc.) and sequential circuits (flip-flops, registers, counters).
3. Explore memory devices (ROM, RAM, FPGA, etc.) and finite state machines, including Moore & Mealy models and state minimization.

COURSE OUTCOME:

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

CO-1:	Understand Boolean algebra, logic gates, number systems, codes, and logic families in digital systems.	K1
CO-2:	Apply minimization techniques to optimize digital circuits for real-time applications.	K3
CO-3:	Analyze and design combinational circuits for digital system implementation.	K2
CO-4:	Design modular combinational circuits using MUX/DEMUX, decoders, and encoders	K2
CO-5:	Understand and implement synchronous sequential circuits in digital systems.	K2
CO-6:	Explore memory elements, programmable devices, and use HDL & EDA tools for digital design and simulation.	K4

COURSE CONTENT:

MODULE 1:	NUMBER SYSTEM AND CODES	6 Hours
Number System and Codes: Decimal, binary, octal and hexadecimal number systems and their arithmetic operations, conversion of one number system to another, Signed and floating point representations of binary numbers, 1's complement and 2's complement representations, Binary codes, natural BCD codes, Excess-3, Gray codes, Alphanumeric codes, code conversion- from one code to another.		
MODULE 2:	**LOGIC GATES, BOOLEAN ALGEBRA & BASIC LOGIC FAMILIES**	**12 Hours**
Logic Gates, Boolean Algebra & Basic logic families: NOT, AND, OR, NAND, NOR, XOR and XNOR – operations, truth tables and Venn diagram representations, universal gates, postulates and laws of Boolean algebra, De Morgan's theorem, minterms and maxterms, SOP and POS forms, Switching algebra, Minimizing functions using Kmaps, Minimization using QM method, Different logic families: TTL, ECL.		
MODULE 3:	**COMBINATIONAL AND ARITHMETIC LOGIC CIRCUITS**	**7 Hours**
Combinational and arithmetic logic circuits: Adders/subtractors circuit using logic gates, fast adder, magnitude comparator, multiplexer demultiplexers, encoders, decoders, priority encoders, parity generator and checkers, BCD adder and subtractor.		
MODULE 4:	**SEQUENTIAL LOGIC CIRCUITS**	**8 Hours**
Sequential Logic Circuits: Flip flops and latches, S-R, J-K, D and T type flip-flops and their conversions, master-slave configuration, edge triggered and level triggered clock, registers, shift registers, synchronous and asynchronous counters, ring and Johnson (twisted ring) counters, Modulus Counters.		
MODULE 5:	**MEMORY AND PROGRAMMABLE LOGIC DEVICES**	**6 Hours**
Memory and Programmable Logic Devices: ROM, PROM, RAM-SRAM, DRAM, EPROM, EEPROM, Flash ROM, Programmable and gated array devices for designing combinational circuits PAL, PLA, PLD, CPLD, FPGA with examples.		
MODULE 6:	**FINITE STATE MACHINES**	**6 Hours**
Finite State Machines: Finite state machine state transition diagrams and state transition tables, Moore & Mealy machine state diagram, state variable, state table and state minimization, design of state machines using combinational logic circuits and memories.		
	TOTAL LECTURES	**45 Hours**

Books:

1. D. P. Leach and A. Malvino, "Digital Principles and Applications", 7th Edi. McGraw Hill.
2. M. Morris Mano & M. D. Ciletti, "Digital Design", 3rd Edition, Prentice Hall.
3. A. Anand Kumar, "Fundamentals of Digital Circuits", Prentice Hall.
4. S. Salivahanan and S. Arivazhagan, "Digital Circuits & Design", Vikas.
5. D. L. Schilling and H. Taub, "Digital Integrated Electronics", McGraw Hill.
6. J. Bhaskar, "A VHDL Primer", Pearson.

Data Structure and Algorithms (TIU-UCS-T201)

Program: B. Tech. in CSE-AI	**Year, Semester:** 2nd Yr., 3rd Sem
Course Title: Data Structure and Algorithms	**Subject Code:** TIU-UCS-T201
Contact Hours/Week: 3–0–0 (L–T–P)	**Credit:** 3

COURSE OBJECTIVE:

1. Introduce fundamental data structures, including linear and nonlinear structures, and their real-world applications to help students understand their significance in problem-solving.
2. Enable students to develop and implement various data structures and algorithms efficiently using programming techniques.
3. Equip students with the ability to analyze the time and space complexity of algorithms and make informed trade-offs for optimizing performance.
4. Encourage students to apply data structures and algorithmic principles to design and develop efficient solutions for real-world computational problems.

COURSE OUTCOME:

The students will be able to:

CO-1	Understand the concepts and applications of different types of data structures	K2
CO-2	Develop programs to implement linear and nonlinear data structures	K3
CO-3	Be able to learn various algorithms and their implementations	K3
CO-4	Analyze algorithms to do efficiency tradeoffs	K4
CO-5	Apply the concepts of data structures and algorithms to find efficient solutions for real world problems	K3
CO-6	Understand the concepts of complex data structures and algorithms.	K5

COURSE CONTENT:

MODULE 1:	**Fundamentals of DSA**	**6 Hours**
Basic Concepts of Data Representation: Abstract Data Types, Fundamental and Derived Data Types, Representation, Primitive Data Structures. Introduction to Algorithm Design and Data Structures: Algorithm Definition, Comparison of Algorithms, Top-Down and Bottom-Up Approaches to Algorithm Design, Analysis of Algorithm, Complexity Measures in Terms of Time and Space, Structured Approach to Programming.		
MODULE 2:	**Arrays**	**10 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.		

MODULE 3:	Stack, Queue and LinkedList	11 Hours
Stacks and Queues: Representation of Stacks and Queues using Arrays and Linked List, Circular Queues, Priority Queue and D-Queue. Applications of Stacks, Conversion from Infix to Postfix and Prefix Expressions, Evaluation of Postfix Expression Using Stacks. Linked Lists: Single Linked List, Operations on List, Linked Stacks and Queues, Polynomial Representation and Manipulation Using Linked Lists, Circular Linked Lists, Doubly Linked Lists.		
MODULE 4:	**Trees and Graphs**	**10 Hours**
Trees: Binary Tree, Traversal Methods: Preorder, In-Order, Post-Order Traversal (Recursive and Non-Recursive), Algorithms for Above Mentioned Traversal Methods. Representation of Trees and Its Applications. Binary Tree. Binary Search Tree, Height Balanced (AVL) Tree, B-Trees, B+ Tree, Min Heap, Max Heap Graphs: Graph Representation, Adjacency Matrix, Adjacency Lists, Traversal Schemes, Depth First Search, Breadth First Search.		
MODULE 5:	**Searching, Sorting and Hashing**	**8 Hours**
Searching, Sorting and Complexity: Searching: Sequential and Binary Searches, Indexed Search, Hashing Schemes. Sorting: Insertion, Selection, Bubble, Quick, Merge.		
	TOTAL LECTURES	**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

Computer Organisation (TIU-UCS-T207)

Program: B. Tech. in CSE-AI	**Year, Semester:** 2nd Yr., 3rd Sem
Course Title: Computer Organization	**Subject Code:** TIU-UCS-T207
Contact Hours/Week: 3–0–0 (L–T–P)	**Credit:** 3

COURSE OBJECTIVE:

Enable the student to:

1. Understand fundamental blocks of computer architecture
2. Understand memory Hierarchy and how does it help in system performance
3. Understand pipelining techniques to improve system performance
4. Understand CPU and CU design

COURSE OUTCOME:

The student will be able to:

CO 1:	Describe Stored Program Digital Computer System	K1
CO 2:	Identify & apply appropriate procedures and algorithms of Computer Arithmetic	K3
CO 3:	Explain different aspects of Central Processing Unit (CPU).	K3
CO 4:	Understand the fundamentals of Memory Unit and illustrate memory operations.	K2
CO 5:	Explain models of I/O operations & the I/O subsystems.	K3
CO 6:	Identify the micro-instructions and basics of Computer Architecture.	K4

COURSE CONTENT:

MODULE 1:	**BASIC FUNCTIONAL BLOCKS OF A COMPUTER**	**10 Hours**
Von Neumann machines, Harvard Architecture, SISD, MISD, MIMD, Single instruction multiple data stream (SIMD) architectures concept of operating systems and processes, processor register sets, processor instruction sets, processor architecture, memory hierarchy, Parallel Processor and Pipeline Architecture.		
MODULE 2:	**DATA REPRESENTATION & COMPUTER ARITHMATIC**	**7 Hours**
Data Representation: Signed number representation, fixed and floating-point representations, Computer arithmetic - integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication -Booth multiplier, Division - non-restoring and restoring techniques.		
MODULE 3:	**CPU AND CONTROL UNIT DESIGN**	**7 Hours**
CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU - registers, instruction execution cycle, Basic Instruction format, Immediate, Direct address, Indirect address, Effective addresses. Instruction Formats: Memory/ Register/Input-Output reference, Types of Instruction: Data Transfer/ Data Manipulation/ Program Control, Zero/One/Two/Three address instructions, RISC instructions, RTL interpretation of instructions, addressing modes, instruction set. Case study - instruction sets of some common CPUs.		
MODULE 4:	**MEMORY ORGANISATION**	**7 Hours**
Concept of hierarchical memory organization, Memory interleaving, Semiconductor memory technologies, primary memory and concept of cache memory.		
MODULE 5:	**PERIPHERAL DEVICES AND THEIR CHARACTERISTICS**	**7 Hours**
Peripheral Devices and Their Characteristics: Input-output subsystems, I/O transfers – program controlled, interrupt driven and DMA		

MODULE 6:	PIPELINEING	7 Hours
Basic concepts of pipelining, throughput and speedup, pipeline hazards. (Parallel Processor)		
TOTAL LECTURES		45 Hours

Books:

1. Computer System Architecture M. M. Mano:, 3rd ed., Prentice Hall of India, New Delhi, 1993.
2. Computer Organization and Design: The Hardware/Software Interface, David A. Patterson and John L. Hennessy.
3. Computer Organization and Embedded Systems, Carl Hamacher.
4. Computer Architecture and Organization, John P. Hayes.
5. Computer Organization and Architecture: Designing for Performance, William Stallings.
6. Computer System Design and Architecture, Vincent P. Heuring and Harry F. Jordan

Computer Organisation Lab (TIU-UCS-L207)

Program: B.Tech. in CSE-AI	**Year, Semester:** 2nd, 3rd.
Course Title: Computer Organisation Lab	**Subject Code:** TIU-UCS-L207
Contact Hours/Week: 0–0–3	**Credit:** 1.5

COURSE OBJECTIVE :

Enable the student to:

1. Understand the fundamental principles of computer organization and digital system design.
2. Implement logic circuits and understand their role in computing systems.
3. Design and analyze basic components of computer architecture, including ALU and memory.

COURSE OUTCOME :

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

CO-1	Describe the fundamental aspects of computer organization design and analysis.	K3
CO-2	Explain the basic hardware components using Integrated Circuits in this lab course.	K3
CO-3	Identify the different logic gates and demonstrate their applications.	K3
CO-4	Implement and apply hardware realizations across various domains	K4
CO-5	Design the memory unit of a computer system.	K4
CO-6	Construct an Arithmetic Logic Unit (ALU) for a computer system	K3

COURSE CONTENT:

MODULE 1:	BASICS OF DIGITAL LOGIC	9 Hours

Introduction to number systems, Boolean algebra, Logic gates and truth tables, Simplification using K-map		
MODULE 2:	**COMBINATIONAL CIRCUITS**	**9 Hours**
Design and implementation of Half adder, Full adder, Multiplexers, and Decoders		
MODULE 3:	**SEQUENTIAL CIRCUITS**	**6 Hours**
Introduction to flip-flops (SR, D, JK, T), Registers, Counters, and their applications		
MODULE 4:	**MEMORY ORGANIZATION**	**6 Hours**
RAM and ROM structures, Cache memory, Design of basic memory unit		
MODULE 5:	**ARITHMETIC LOGIC UNIT (ALU) DESIGN**	**6 Hours**
Design of a simple ALU, Implementation of arithmetic operations (addition, subtraction, multiplication)		
MODULE 6:	**CPU ORGANIZATION AND PIPELINING**	**9 Hours**
Basic CPU architecture, Instruction execution cycle, Introduction to pipelining		
	TOTAL LAB HOURS	**45 Hours**

Books:

1. M. Morris Mano & Michael D. Ciletti - Digital Design (5th ed.), Pearson

Digital Electronics Lab (TIU-UEC-L211)

Program: B.Tech. in CSE/CSEAI	**Year, Semester:** 2nd Yr, 3rd Sem
Course Title: Digital Electronics Lab	**Subject Code:** TIU-UEC-L211
Contact Hours/Week: 0–0–3	**Credit:** 1.5

COURSE OBJECTIVE :

Enable the student to:

1. Study basic and universal logic gates and verify their truth tables through practical implementation.
2. Design arithmetic circuits, multiplexers, decoders, and code converters.
3. Implement flip-flops and counters to understand memory storage and sequential logic.
4. Gain hands-on experience in troubleshooting and designing digital electronic circuits.

COURSE OUTCOME :

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

CO-1	Understand the fundamental concepts of logic gates and their operations.	K2
CO-2	Implement and Analyze logic circuits using universal gates and verify their truth tables.	K4

CO-3	Analyze and Design combinational circuits and validate their functionalities.	K4
CO-4	Apply the working principles of basic sequential circuits.	K3
CO-5	Design and Develop optimized digital circuits for real-world applications using logic gates and sequential elements.	K6
CO-6	Evaluate the performance of various digital circuits and troubleshoot faults in hardware implementation.	K5

COURSE CONTENT :

MODULE 1:	**BASIC LOGIC GATES**	**9 Hours**
Basic gates (AND, OR, NOT), universal gates (NAND, NOR), and exclusive gates (XOR, XNOR)		
MODULE 2:	**DATA REPRESENTATION & CONVERSION**	**6 Hours**
Even and odd parity generation and checking, Binary to Gray and Gray to Binary Conversion		
MODULE 3:	**ARITHMETIC CIRCUITS**	**9 Hours**
Half Adder, Full Adder, Half Subtractor, and Full Subtractor circuits		
MODULE 4:	**COMBINATIONAL LOGIC CIRCUITS**	**9 Hours**
Multiplexer, decoder		
MODULE 5:	**SEQUENTIAL CIRCUITS - FLIP-FLOPS**	**6 Hours**
Different types of flip-flops (SR, JK, D, and T)		
MODULE 6:	**SEQUENTIAL CIRCUITS - COUNTERS**	**6 Hours**
Asynchronous and synchronous counters		
	TOTAL LAB HOURS	**45 Hours**

Books:

1. M. Morris Mano & Michael D. Ciletti – Digital Design (5th Edition) PEARSON.
2. Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss – Digital Systems: Principles and Applications (12th Edition) PEARSON.
3. A. Anand Kumar – Fundamentals of Digital Circuits (4th Edition)PHI.
4. S Salivahanan, S Arivazhagan - Digital Circuits And Design (5th Edition) OXFORD UNIVERSITY PRESS

Data Structures and Algorithms Lab (TIU-UCS-L209)

Program: B.Tech. in CSE-AI	**Year, Semester:** 2nd, 3rd.
Course Title: Data Structures and Algorithms Lab	**Subject Code:**TIU-UCS-L209
Contact Hours/Week: 0–0–3	**Credit:** 1.5

COURSE OBJECTIVE :

Enable the student to:

1. Develop and implement fundamental data structures such as arrays, linked lists, stacks, queues, trees, and graphs to efficiently store and manage data.

2. Analyze and apply searching and sorting algorithms, including linear search, binary search, and various sorting techniques, to optimize computational performance.
3. Enhance problem-solving skills by utilizing recursion and advanced data structures in real-world applications, ensuring efficient algorithmic design and implementation.

COURSE OUTCOME :

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

CO-1	Describe the fundamental concepts of data structures.	K3
CO-2	Implement structures and pointers in programming tasks.	K3
CO-3	Differentiate between various types of data structures (linear and nonlinear) and apply them in practical scenarios.	K4
CO-4	Explain the concept and workings of recursion.	K3
CO-5	Compare linear and binary search algorithms.	K4
CO-6	Master various sorting algorithms and apply them in problem-solving tasks.	K4

COURSE CONTENT :

MODULE 1:	**INTRODUCTION TO LINKED LISTS**	**6 Hours**
Concept of dynamic memory allocation and pointers; Singly Linked List: Implementation of creation, insertion, deletion, and traversal operations; Doubly Linked List: Implementation of creation, insertion, deletion, and traversal operations; Circular Linked List: Implementation of creation, insertion, deletion, and traversal operations.		
MODULE 2:	**STACK AND QUEUE IMPLEMENTATION**	**6 Hours**
Stack: Concept, applications (Expression evaluation, Backtracking), Implementation of stack operations using arrays and pointers; Queue: Concept, types (Linear Queue, Circular Queue, Priority Queue), Implementation of queue operations using arrays and pointers.		
MODULE 3:	**SEARCHING TECHNIQUES**	**6 Hours**
Linear Search: Implementation using iterative and recursive functions; Binary Search: Implementation using iterative and recursive functions; Performance analysis of searching algorithms.		
MODULE 4:	**SORTING TECHNIQUES**	**9 Hours**
Bubble Sort: Concept and implementation; Selection Sort: Concept and implementation; Insertion Sort: Concept and implementation; Comparative analysis of sorting algorithms based on time complexity.		
MODULE 5:	**TREE DATA STRUCTURES AND TRAVERSALS**	**9 Hours**
Introduction to Trees: Binary Trees, Binary Search Trees (BST); Tree Traversal Methods: Inorder, Preorder, Postorder traversal implementation; Recursive and iterative approaches.		
MODULE 6:	**GRAPH REPRESENTATION AND TRAVERSAL ALGORITHMS**	**9 Hours**
Introduction to Graphs: Adjacency list and adjacency matrix representation. Graph Traversal Techniques: Depth-First Search (DFS) implementation, Breadth-First Search (BFS) implementation.		
TOTAL LAB HOURS		**45 Hours**

Books:

1. Seymour Lipschutz, Data Structures, Revised First Edition, McGraw-Hill Education.
2. Aaron M. Tenenbaum, Data Structures Using C, Prentice Hall.
3. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Introduction to Algorithms, Eastern Economy Edition, PHI Learning Pvt. Ltd., 2010.
4. Donald Knuth, Art of Computer Programming, The: Volume 1: Fundamental Algorithms, Addison-Wesley, 1997.

Career Advancement & Skill Development-III (TIU-UEN-S297)

Program:B.Tech CSE_AI	**Year, Semester: 2nd year, 3rd Sem**
Course Title: CAREER ADVANCEMENT & SKILL DEVELOPMENT-III	**Subject Code:** TIU-UEN-S297
Contact Hours/Week: 2-0-0 (L-T-P)	**Credit:** 2

COURSE OBJECTIVE :

Enable the student to:

1. Acquire basic communication skills in French.
2. Develop listening, speaking, reading, and writing abilities at a beginner level.
3. Understand and use simple grammatical structures and everyday vocabulary.
4. Engage in basic conversations in French related to common situations.

COURSE OUTCOME :

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

CO-1:	Recognise and use common French greetings and expressions.	K1
CO-2:	Memorise and repeat simple sentences using regular verbs and basic vocabulary.	K1
CO-3:	Understand and respond to basic questions about personal identity.	K2
CO-4:	Identify and explain short passages related to daily life.	K2
CO-5:	Construct short texts such as self-introductions and informal messages.	K3
CO-6:	Arrange isolated sentences and questions to engage in simple spoken exchanges in a variety of familiar contexts.	K4

COURSE CONTENT :

MODULE 1:	**INTRODUCTION TO FRENCH LANGUAGE**	**6 Hours**
The French alphabet and pronunciation, Greetings and introductions, Numbers and basic expressions of time		
MODULE 2:	**IDENTITY AND PERSONAL INFORMATION**	**6 Hours**
Talking about oneself and others, Nationalities, professions, and family, Using "être" and "avoir" verbs		
MODULE 3:	**EVERYDAY INTERACTIONS**	**6 Hours**
Asking for and giving personal details, Talking about preferences and habits, Introduction to regular -ER verbs		
MODULE 4:	**NAVIGATING DAILY SITUATIONS**	**6 Hours**
Ordering at a café or restaurant, Asking for directions, Using "aller" and "faire" verbs		

MODULE 5:	**DESCRIBING DAILY LIFE**	**6 Hours**
Talking about routines and leisure activities, Expressing likes and dislikes, Introduction to present tense conjugation		
	TOTAL LECTURES	**30 Hours**

Books:

Tech French - French for Science and Technology, Goyal Publishers, 2011