

Name of the Programme: M.Sc. in Artificial Intelligence

Course Code: CSI-503

Title of the Course: Algorithms and Data Structure Lab

Number of Credits: 2 (0L+0T+2P)

Effective from AY: 2023-24

<u>Prerequisites for the course:</u>	Programming in Python	
<u>Objectives:</u>	The aim of the course is to introduce the fundamental concept of data structures and to emphasize the importance of data structures in developing and implementing efficient algorithms. It provides an exposure to various data structures and algorithm analysis including lists, stacks, queues, trees, and various sorting and searching algorithms.	
<u>Content:</u>	Object-Oriented Design Goals, Object-Oriented Design Principles. 1.The programming assignment should introduce and enforce the concepts of encapsulation, polymorphism and Inheritance. ADT Specifications and Implementation of following basic data structures	3 hours
	2. Singly Linked Linear Lists	3 hours
	3. Singly Linked Circular Lists	2 hours
	4. Doubly Linked Linear Lists	2 hours
	5. Doubly Linked circular Lists	2 hours
	6. Stack using linked list	2 hours
	7. Queue using linked list	2 hours
	ADT Specifications and Implementation of following non-linear data structures 8. Binary Trees	4 hours
	9. Binary Search Trees	3 hours
	10. AVL Trees	3 hours
	11. B-Trees and its variants	3 hours
	Application of stack 12. Program to convert the given infix expression to postfix expression using stack	3 hours
	13. Program to evaluate a postfix expression using stack.	2 hours
	14. Program to traverse a binary tree in the following way: Pre-order, In-order, Post-order	3 hours
	Applications of Binary Trees 15. Write a program to implement Huffman encoding using Binary tree.	2 hours
	16. Write a program to create a binary tree for the given infix expression.	2 hours
	Applications of AVL Trees 17. Write a program that reads a list of names and telephone number from a text file and inserts them into an AVL tree. Write a function to allow the user to search the tree. Searching and sorting	3 hours
	18. Program to implement Binary search technique using Iterative method and Recursive methods.	3 hours
	19. Programs to implement following sorting algorithm- Bubble sort, Selection sort, Insertion sort, Quicksort, Merge sort and Heap sort	3 hours
	Implementation of Dynamic programming 20. Assembly line scheduling	4 hours

	21. Matrix-chain multiplication	3 hours
	Implementation of Greedy algorithms	3 hours
	22. Prim's Algorithm	
	23. Kruskal's Algorithm	
<u>Pedagogy:</u>	Lectures/Practical/ tutorials/assignments/self-study	
<u>References/Readings:</u>	1. Horowitz, Ellis, Sartaj Sahni, and Susan Anderson-Freed. Fundamentals of data structures in C. WH Freeman & Co., 1992. 2. Benjamin Baka, Basant Agarwal, "Hands on Data Structure and Algorithms with Python", Second Edition, O'Reilly, 2018 3. Cormen Thomas, L. Charles, R. Ronald, S. Clifford, "Introduction to Algorithms", Second Edition,EEE, PHI. 4. Allen, Weiss Mark. Data structures and algorithm analysis in C. Pearson Education India, 2011. 5. Algorithms, by Dasgupta, Papadimitriou, and Vazirani, McGraw-Hill.	
<u>Course Outcomes:</u>	1. Implement common data structures such as lists, stacks, queues, graphs, and binary trees for solving programming problems. 2. Identify and use appropriate data structures in the context of a solution to a given problem. 3. Learn to understand the implementation issues 4. Overall learn the foundation required for programming	