Name of the Programme: M.Sc. in Artificial Intelligence
Course Code: CSI-502
Title of the Course: Algorithms and Data Structure
Number of Credits: 2 (2L+0T+0P)
Effective from AY: 2023-24

Prerequisites for the course:	Programming in Python	
Objectives:	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.	
Content:	Introduction: Three level Approach - Application/User level, Abstract/Logical level, Physical/Implementation level; Concept of Abstract Data Types (ADTs), Data Structure definition, Data type vs. data structure, Applications of data structures,	3 hours
	Algorithms analysis and its complexity, Best case, worst case , and Average case performance, time-space tradeoff, Asymptotic Analysis, Big-O notation.	3 hours
	Linear Data Structures: Array and its application: Polynomials, Sparse matrices, String-pattern Matching. Linked Lists, Doubly linked list, Circular linked list, Stack and Queues.	5 hours
	Nonlinear Data Structures: Trees: Binary tree representation, Binary Search Trees, AVL Trees, M-way Search Trees, B-trees. B tree algorithms, Heap Structures.	5 hours
	Graphs: Graph representations; Graph Traversals	2 hours
	Complexity of Searching & Sorting algorithms: Bubble sort, Quick sort, Selection sort, Insertion sort, Merge sort and Heap sort. An Empirical Comparison of Sorting Algorithms, Lower bounds for Sorting. Linear search, binary search.	8 hours
	Dynamic programming and Greedy algorithms: Assembly line scheduling, Matrix-chain multiplication; Prim‟s Algorithm, Kruskal‟s Algorithm	4 hours
Pedagogy:	Practical/ tutorials/assignments/self-study	
References /Readings:	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.	
Course Outcomes:	1. Understanding of various data structures. 2. Proficiency in algorithmic problem-solving. 3. Practical implementation and application of data structures. 4. Enhanced critical thinking and problem analysis skills.	

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