

UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	Advanced Data Structures and Algorithms Practical		
Core–III - Practical	I Year & I Semester	Credit:3	436C1C

Objectives:

To provide the foundations of the practical implementation and usage of Algorithms and Data Structures.

To ensure that the student evolves into a competent programmer capable of designing and analysing implementations of algorithms and data structures for different kinds of problems.

To expose the student to the algorithm analysis techniques,

To make the students understand the theory of reductions, and to the classification of problems.

To make the students to be sure of complexity classes like NP.

Outcomes:

1.	Design and analyse programming problem statements.	K1, K2
2.	Choose appropriate data structures and algorithms, understand the ADT/libraries, and use it to design algorithms for a specific problem.	K1, K2
3.	Be familiar with programming language constructs available for rapid application development,	K3, K4
4.	Understand the necessary programmatic abstraction to solve problems.	K4, K5
5.	Gain the capacity to solve real life problems by matching to the available algorithms.	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

Implement the following using Java or Python

- Write a program to perform the following operations on a heterogeneous singly linked list. i) Creation ii) Insertion iii) Deletion iv) Traversal.
- Write a program to perform the following operations on a heterogeneous doubly linked list. i) Creation ii) Insertion iii) Deletion iv) Traversal in both ways
- Write a program that implements using java generic class, the stack (its operations)
- Write a program that implements using java generic class, the queue (its operations)
- Write a program that implements the Quick sort method.
- Write a program that implement the Merge sort method.
- Write a program that implement the SHELL sort method.
- Write a program to perform the following: i) Creating a Binary Tree of integers ii) Traversing the above binary tree in preorder, inorder and postorder.
- Write a program to perform the following: i) Creating a AVL Tree ii) insertion iii) deletion iv) Traversing the above AVL tree in preorder, inorder and postorder.
- Write a program that uses functions to perform the following: i) Creating a SplayTree ii) traverse

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11. Write a program to perform the following: i) Creating a B-Tree of integers ii) insertion iii) deletion
12. Write a program that implements Kruskal's algorithm using a disjoint set data structure. The program takes as input a file (data.txt), in which each line either represents a vertex or an edge. For the edge lines, the first integer on that line representing the starting vertex, the second the ending vertex, and the third the weight of the edge. Use this file to construct, line by line, the graph upon which Kruskal's algorithm will be run (do NOT hardcode this graph!).
13. Write a program to simulate various graph traversing algorithms.
14. Write a program to find the minimal spanning tree of a graph using the Prim's algorithm.
15. Write a program to find shortest path using Bellman Ford's Algorithm

Recommended Texts:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++:Pearson Education; 4th Edition,

Reference Books:

1. Sartaj Sahni, Data Structures Algorithms and Applications in C++, 2nd Edition, Universities Press, 2007.
2. Ellis Horowitz, Sartaj Sahni, Rajasekharan, Fundamentals of Algorithms, 2nd Edition, Universities Press, 2009.
3. Aho V Alfred, Hapcroft E John, Ullman D Jeffry, Data Structures and Algorithms, 1st Edition, Pearson Education, 2002.
4. Adam Drozdek, Thomson, Data Structures and Algorithms in JAVA, 3rd Edition, Cengage Learning, 2008.
5. Horowitz, Sahni, Mehta, Fundamentals of Data Structures in C++, 2nd Edition, Universities Press, 2007.

Web References:

1. <https://nptel.ac.in/courses/106102064>

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	S	M	M	S	M	S	L	S	L	M
CO 2	S	L	S	M	S	L	M	M	S	S
CO 3	M	S	L	M	M	S	L	S	L	S
CO 4	L	S	S	1	S	M	S	L	S	M
CO 5	S	M	M	S	L	S	M	S	L	S

S-Strong M-Medium L-Low