

UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: II

Semester: IV

Data Structures and Algorithms	225C4A
Credits 5	Lecture Hours:4 per week
<p>Learning Objectives: (for teachers: what they have to do in the class/lab/field)</p> <ul style="list-style-type: none"> • To impart the basic concepts of data structures and algorithms. • To acquaint the student with the basics of the various data structures • This course also gives insight into the various algorithm design techniques 	
<p>Course Outcomes: (for students: To know what they are going to learn)</p> <p>CO1: To introduce the concepts of Data structures and to understand simple linear data structures.</p> <p>CO2: Learn the basics of stack data structure, its implementation and application</p> <p>CO3: Use the appropriate data structure in context of solution of given problem and demonstrate a familiarity with major data structures.</p> <p>CO4: To introduce the basic concepts of algorithms</p> <p>CO5: To give clear idea on algorithmic design paradigms like Divide and conquer and Backtracking,</p>	

Units	Contents
I	<p>INTRODUCTION TO DATA STRUCTURES: Data Structures: Definition- Time & Space Complexity - Arrays: Representation of arrays, Applications of arrays, sparse matrix and its representation - Linear list: Singly linked list implementation, insertion, deletion and searching operations on linear list - Circular linked list: implementation, Double linked list implementation, insertion, deletion and searching operations.</p>
II	<p>STACKS and QUEUES: Operations, array and linked representations of stack, stack applications, infix to postfix conversion, postfix expression evaluation - Queues: operations on queues, array and linked representations - Circular Queue: operations, applications of queues.</p>
III	<p>TREES & GRAPHS: Trees: Definitions and Concepts- Representation of binary tree, Binary tree traversals (Inorder, Postorder, preorder), Binary search trees in arrays– Heaps - AVL Trees – B Trees Graphs: Representation of Graphs- Types of graphs</p>
IV	<p>INTRODUCTION TO ALGORITHMS: Definition of Algorithms- Overview and importance of algorithms- pseudocode conventions, Asymptotic notations, practical complexities. Graph Applications: Breadth first traversal – Depth first traversal- -Single source shortest path – Minimal spanning trees – prim’s and kruskal’s algorithms</p>
V	<p>DIVIDE AND CONQUER ALGORITHMS: General Method – Binary Search- Quick Sort- Merge Sort. BACKTRACKING: General method, 8 Queens, Graph coloring, Hamiltonian cycle.</p>

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Learning Resources:

Recommended Texts

1. Ellis Horowitz , Sartaj Sahni, Susan Anderson Freed, Second Edition ,
“Fundamentals of Data in C”, Universities Press
2. E. Horowitz, S. Sahni and S. Rajasekaran, Second Edition ,“Fundamentals of
Computer Algorithms “ Universities Press

Reference Books

1. Seymour Lipschutz ,”Data Structures with C”, First Edition, Schaum’s outline series
in computers, Tata McGraw Hill.
2. R.Krishnamoorthy and G.Indirani Kumaravel, Data Structures using C, Tata
McGrawHill – 2008.
3. A.K.Sharma, Data Structures using C , Pearson Education India,2011.
4. G. Brassard and P. Bratley, “Fundamentals of Algorithms”, PHI, New Delhi, 1997.
5. A.V. Aho, J.E. Hopcroft, J.D. Ullmann,, “The design and analysis of
ComputerAlgorithms”, Addison Wesley, Boston, 1974
6. Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to
Algorithms, Third edition, MIT Press, 2009
7. Sanjoy Dasgupta, C.Papadimitriou and U.Vazirani , Algorithms , Tata McGraw-Hill,
2008.