

## **SHORT SYLLABUS**

### **BCSE202L    Data Structures and Algorithms    (3-0-0-3)**

Importance of algorithms and data structures - Algorithm analysis - Algorithm efficiency – Linear Data Structures: Arrays, Stacks, Queues, List – Searching and Sorting – Trees – Binary Trees – Binary Search Trees – Graphs: Traversals – Hashing and its types – Heaps – AVL Trees and its operations.

BCSE202L	Data Structures and Algorithms	L	T	P	C
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Pre-requisite	NIL	Syllabus version			
		1.0			
Course Objectives					
1. To impart basic concepts of data structures and algorithms.					
2. To differentiate linear, non-linear data structures and their operations.					
3. To comprehend the necessity of time complexity in algorithms.					
Course Outcomes					
On completion of this course, students should be able to:					
1. Understand the fundamental analysis and time complexity for a given problem.					
2. Articulate linear, non-linear data structures and legal operations permitted on them.					
3. Identify and apply suitable algorithms for searching and sorting.					
4. Discover various tree and graph traversals.					
5. Explicate hashing, heaps and AVL trees and realize their applications.					
Module:1	Algorithm Analysis	8 hours			
Importance of algorithms and data structures - Fundamentals of algorithm analysis: Space and time complexity of an algorithm, Types of asymptotic notations and orders of growth - Algorithm efficiency – best case, worst case, average case - Analysis of non-recursive and recursive algorithms - Asymptotic analysis for recurrence relation: Iteration Method, Substitution Method, Master Method and Recursive Tree Method.					
Module:2	Linear Data Structures	7 hours			
Arrays: 1D and 2D array- Stack - Applications of stack: Expression Evaluation, Conversion of Infix to postfix and prefix expression, Tower of Hanoi – Queue - Types of Queue: Circular Queue, Double Ended Queue (deQueue) - Applications – List: Singly linked lists, Doubly linked lists, Circular linked lists- Applications: Polynomial Manipulation.					
Module:3	Searching and Sorting	7 hours			
Searching: Linear Search and binary search – Applications.					
Sorting: Insertion sort, Selection sort, Bubble sort, Counting sort, Quick sort, Merge sort - Analysis of sorting algorithms.					
Module:4	Trees	6 hours			
Introduction - Binary Tree: Definition and Properties - Tree Traversals- Expression Trees:- Binary Search Trees - Operations in BST: insertion, deletion, finding min and max, finding the k <sup>th</sup> minimum element.					
Module:5	Graphs	6 hours			
Terminology – Representation of Graph – Graph Traversal: Breadth First Search (BFS), Depth First Search (DFS) - Minimum Spanning Tree: Prim's, Kruskal's - Single Source Shortest Path: Dijkstra's Algorithm.					
Module:6	Hashing	4 hours			
Hash functions - Separate chaining - Open hashing: Linear probing, Quadratic probing, Double hashing - Closed hashing - Random probing – Rehashing - Extendible hashing.					
Module:7	Heaps and AVL Trees	5 hours			
Heaps - Heap sort- Applications -Priority Queue using Heaps. AVL trees: Terminology, basic operations (rotation, insertion and deletion).					
Module:8	Contemporary Issues	2 hours			
Total Lecture hours:					
45 hours					
Text Book					
1.	Mark A. Weiss, Data Structures & Algorithm Analysis in C++, 4 <sup>th</sup> Edition, 2013, Pearson Education.				

Reference Books			
1.	Alfred V. Aho, Jeffrey D. Ullman and John E. Hopcroft, Data Structures and Algorithms, 1983, Pearson Education.		
2.	Horowitz, Sahni and S. Anderson-Freed, Fundamentals of Data Structures in C, 2008, 2 <sup>nd</sup> Edition, Universities Press.		
3.	Thomas H. Cormen, C.E. Leiserson, R L. Rivest and C. Stein, Introduction to Algorithms, 2009, 3 <sup>rd</sup> Edition, MIT Press.		
Mode of Evaluation: CAT, Assignment, Quiz and FAT			
Recommended by Board of Studies		04-03-2022	
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