# **ADVANCE DATA STRUCTURES**

I Semester: CSE								
Course Code	Category	Hou	rs / V	Veek	Credits	Ma	ximum	Marks
DCSD02	Corre	L	Т	Р	С	CIA	SEE	Total
DCSD02	Core	3	0	0	3	30	70	100
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil			Total Classes: 45			

#### I. COURSE OVERVIEW:

The course covers the concepts of data structures and techniques for analyzing the performance and complexity of the algorithms on data structures and their applications using mathematical tools like asymptotic notations and also covers concepts like dictionaries, hash tables, trees and graphs, search trees.

## **II.OBJECTIVES:**

#### The students will try to learn:

- I. The data structures and techniques of algorithm analysis.
- II. The problems using different data structures and compare their performance and tradeoffs.
- III. The implementation of linked data structures such as linked lists and binary trees.
- IV. The graph algorithms such as shortest path and minimum spanning tree.
- V. The Advanced data structures such as balanced search trees, hash tables, priority queues

## **III.COURSE OUTCOMES:**

#### After successful completion of the course, students should be able to:

CO 1	Analyze the performance and complexity of the algorithms on data structures	Analyze
	and their applications using mathematical tools like asymptotic notations.	
CO 2	Construct complex data structures for processing, organizing, and accessing	Apply
	information.	
CO 3	Design and Implement non-linear data structures using trees and graphs.	Create
CO 4	Organize data in the form of trees and graphs for data in the form of trees and	Create
	graphs.	
CO 5	Model the real-world data using red black and splay trees comparison of text,	Create
	patterns, and querying.	

## **IV.SYLLABUS.**

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Classes: 09

Algorithm analysis: Algorithms; Performance analysis: Time complexity and space complexity, asymptotic notation: Big Oh, omega and theta notations, complexity analysis examples; Data structures: Linear and non linear data structures, ADT concept, linear list ADT, stack and queue ADTs, array and linked list representations; Circular queue: Insertion and deletion, de queue ADT, priority queue ADT, implementation using heaps, insertion into a max heap, deletion from a max heap, singly linked lists, doubly linked lists, circular linked list.

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UNIT-II	DICTIONARIES, HASH TABLES	Classes: 09

Dictionaries: Linear list representation, operations insertion, deletion and searching, hash table representation, hash functions, collision resolution, separate chaining, open addressing, linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

UNIT-III	TREES AND GRAPHS	Classes: 09
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Trees: Ordinary and binary trees terminology, properties of binary trees, binary tree ADT, representations, recursive and non recursive traversals, threaded binary trees.

Graphs: Graphs terminology, graph ADT, representations, graph traversals; Search methods: DFS and BFS; Applications of Graphs: Minimum cost spanning tree using Kruskal's algorithm, Dijkstra's algorithm for single source shortest path problem.

UNIT-IV	SEARCH TREES I	Classes: 09	
Binary search tree: Binary search tree ADT, insertion, deletion and searching operations, finding the parent of a given			
node, attaining a reference to a node, finding the smallest and largest values in the binary search tree; Balanced search			

trees: AVL trees, definition, height of an AVL tree; Operations : Insertion, deletion and searching.

## UNIT-V SEARCH TREES II

Classes: 09

Red-Black and Splay Trees; B trees: Definition, operations and applications; R trees: Nearest neighbor query, join and range queries; Comparison of search trees; Text compression: Huffman coding and decoding; Pattern matching: KMP algorithm.

#### **Text Books:**

- 1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Universities Press Private Limited, India, 2<sup>nd</sup> Edition, 2008.
- 2. G.A. V.Pai, "Data Structures and Algorithms", Tata McGraw Hill, New Delhi, 1st Edition, 2008.
- 3. M. A. Weiss, Addison Wesley, "Data Structures and Algorithm Analysis in Java", Pearson Education, 2<sup>nd</sup> Edition, 2005.

## **Reference Books:**

- 1. D. Samanta, "Classic Data Structures", Prentice Hall of India Private Limited, 2<sup>nd</sup> Edition, 2003.
- Aho, Hop craft, Ullman, "Design and Analysis of Computer Algorithms", Pearson Education India, 1<sup>st</sup> Edition, 1998.
- 3. Goodman, Hedetniemi, "Introduction to the Design and Analysis of Algorithms", Tata McGraw Hill, New Delhi, India, 1<sup>st</sup> Edition, 2002.
- 4. Adam Drozdek, "Data Structures and Algorithms in C++", Thomson Course Technology, 3<sup>rd</sup> Edition, 2005.
- 5. M. T. Goodrich, R. Tomassia, "Data structures and Algorithms in Java", Wiley India, 3<sup>rd</sup> Edition, 2011.

#### Web References:

- 1. http://www.tutorialspoint.com/data\_structures\_algorithms/data\_structures\_basics.htm
- 2. http://www.geeksforgeeks.org/b-tree-set-1-introduction-2/
- 3. http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html

## E-Text Books:

https://comsciers.files.wordpress.com/2015/12/horowitz- -of-computer-algorithms-2nd-edition.pdf