

## ADVANCED DATA STRUCTURES SYLLABUS

<b>Course Code:</b>	20CS3402	<b>Year:</b>	II	<b>Semester:</b>	II
<b>Course Category:</b>	Professional Core Course	<b>Branch:</b>	CSE	<b>Course Type:</b>	Theory
<b>Credits:</b>	3	<b>L-T-P:</b>	3-0-0	<b>Prerequisites:</b>	Data Structures (20ES1305), Object Oriented Programming through C++ (20CS3302)
<b>Continuous Internal Evaluation:</b>	30	<b>Semester End Evaluation:</b>	70	<b>Total Marks:</b>	100

### COURSE OUTCOMES

Upon successful completion of the course, Student will be able to

<b>CO1</b>	Understand the basic principles and operations of data structures.	<b>L2</b>
<b>CO2</b>	Apply Hashing, Disjoint sets and String Matching techniques for solving problems effectively.	<b>L3</b>
<b>CO3</b>	Apply the concepts of advanced Trees and Graphs for solving problems effectively.	<b>L3</b>
<b>CO4</b>	Analyze the given scenario and choose appropriate Data Structure for solving problems.	<b>L4</b>

### Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
<b>CO1</b>	3													
<b>CO2</b>	2									1				1
<b>CO3</b>													3	
<b>CO4</b>		2							1	1		1		

Unit No.	SYLLABUS CONTENTS	Mapped CO
I	<b>Hashing</b> – General Idea, Hash Function, Separate Chaining, Hash Tables without linked lists: Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Hash Tables in the Standard Library, Universal Hashing, Extendible Hashing.	CO1, CO2
II	<b>Priority Queues (Heaps)</b> – Model, Simple implementations, Binary Heap: Structure Property, Heap Order Property, Basic Heap Operations: insert, delete, Percolate down, Other Heap Operations.  Binomial Queues: Binomial Queue Structure, Binomial Queue Operations, Implementation of Binomial Queue, Priority Queues in the Standard Library.	CO1, CO3
III	<b>Trees</b> – AVL: Single Rotation, Double Rotation, B-Trees.  <b>Multi-way Search Trees</b> – 2-3 Trees: Searching for an Element in a 2-3 Tree, Inserting a New Element in a 2-3 Tree, Deleting an Element from a 2-3 Tree.  <b>Red-Black Trees</b> – Properties of red-black trees, Rotations, Insertion, Deletion.	CO1, CO3
IV	<b>Graphs Algorithms</b> – Elementary Graph Algorithms: Topological sort, Single Source Shortest Path Algorithms: Dijkstra's, Bellman-Ford, All-Pairs Shortest Paths: Floyd-Warshall's Algorithm.	CO1, CO3
V	<b>Disjoint Sets</b> – Equivalence relation, Basic Data Structure, Simple Union and Find algorithms, Smart Union and Path compression algorithm.  <b>String Matching</b> – The naive string-matching algorithm, The Rabin-Karp algorithm, The Knuth-Morris-Pratt algorithm.	CO1, CO2, CO4

Learning Resources
<b>Text Books</b>
<ol style="list-style-type: none"> <li>1. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, 4<sup>th</sup> Edition, 2014, Pearson.</li> <li>2. Introduction to Algorithms, Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, 3<sup>rd</sup> Edition, 2009, The MIT Press.</li> </ol>
<b>References Text Book</b>
<ol style="list-style-type: none"> <li>1. Fundamentals of Computer Algorithms, Ellis Horowitz, SatrajSahani and Rajasekharam, 2<sup>nd</sup> Edition, 2009, University Press Pvt. Ltd.</li> <li>2. Advanced Data Structures, Reema Thareja, S. Rama Sree, Oxford University Press, 2018.</li> </ol>
<b>e-Resources and other Digital Material</b>
<ol style="list-style-type: none"> <li>1. <a href="http://www.coursera.org/learn/advanced-data-structures">http://www.coursera.org/learn/advanced-data-structures</a></li> <li>2. <a href="http://ocw.mit.edu/6-851S12">http://ocw.mit.edu/6-851S12</a> (MITOPENCOURSEWARE, Massachusetts Institute of Technology)</li> <li>3. <a href="https://nptel.ac.in/courses/106/106/106106133/">https://nptel.ac.in/courses/106/106/106106133/</a></li> <li>4. <a href="https://www.mooc-list.com/search/node?keys=Advanced+Data+Structures">https://www.mooc-list.com/search/node?keys=Advanced+Data+Structures</a></li> <li>5. <a href="http://freevidelectures.com/Course/2279/Data-Structures-And-Algorithms">http://freevidelectures.com/Course/2279/Data-Structures-And-Algorithms</a></li> </ol>