

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY
(Autonomous)

KANURU, VIJAYAWADA-520007

II B.Tech – II Sem CSE(AI&ML)

ADVANCED DATA STRUCTURES

Course Code:	20AM6421	Year:	II	Semester:	II
Course Category:	Honors	Branch:	CSE(AI&ML)	Course Type:	Integrated
Credits:	4	L-T-P:	3-0-2	Prerequisites:	Data Structures
Continuous Internal Evaluation:	30	Semester End Examination:	70	Total Marks:	100

COURSE OUTCOMES

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

CO1	Apply Hashing, Disjoint sets and String Matching techniques for solving problems effectively.	L3
CO2	Apply the concepts of advanced Trees and Graphs for solving problems effectively.	L3
CO3	Analyze the given scenario and choose appropriate Data Structure for solving problems.	L4
CO4	Ability to conduct practical experiments to solve problems using an appropriate data structure.	L4

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3													
CO3		3										2		
CO4		3			3							2		

Unit No.	SYLLABUS CONTENTS	Mapped CO
I	Hashing – 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,CO3, CO4
II	Priority Queues (Heaps) – Model, Simple implementations, Binary Heap: Structure Property, Heap Order Property, Basic Heap Operations: insert, delete, Percolate down, Other Heap Operations.	CO2,CO3, CO4
III	Trees – AVL: Single Rotation, Double Rotation, B-Trees. Multi-way Search Trees – 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. Red-Black Trees – Properties of red-black trees, Rotations, Insertion, Deletion.	CO2,CO3, CO4
IV	Graphs Algorithms – Elementary Graph Algorithms: Topological sort, Single Source Shortest Path Algorithms: Dijkstra's, Bellman-Ford, All-Pairs Shortest Paths: Floyd-Warshall's Algorithm.	CO2,CO3, CO4
V	Disjoint Sets – Equivalence relation, Basic Data Structure, Simple Union and Find algorithms, Smart Union and Path compression algorithm. String Matching – The naive string-matching algorithm, The Rabin-Karp algorithm, The Knuth-Morris-Pratt algorithm.	CO1,CO3, CO4

Learning Resources

Text Books

1. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, 4th Edition, 2014, Pearson.
2. Introduction to Algorithms, Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, 3rd Edition, 2009, The MIT Press.

References Text Book

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahani and Rajasekharam, 2nd Edition, 2009, University Press Pvt. Ltd.
2. Advanced Data Structures, Reema Thareja, S. Rama Sree, Oxford University Press, 2018.

e-Resources and other Digital Material

1. <http://www.coursera.org/learn/advanced-data-structures/>
2. <https://nptel.ac.in/courses/106/106/106106133/>
3. <https://www.mooc-list.com/tags/advanced-data-structures>
4. <http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms/>

EXPT NO	CONTENTS	MAPPED CO
1	a) Implement various Hashing Techniques. b) Develop a solution to the given problem using Hashing Techniques. https://leetcode.com/tag/hash-table/ https://medium.com/@codingfreak/hashing-problems-in-data-structures-c41b77a5119a	CO1, CO2, CO3, CO4
2	a) Implement Binary Heap and its operations. b) Develop a solution to the given problem using Binary Heaps. https://leetcode.com/tag/heap-priority-queue/ https://leetcode.com/discuss/general-discussion/1113631/important-concepts-problems-in-priority-queueheaps	CO1, CO2, CO3, CO4
3	a) Implement AVL Trees and its operations. b) Develop a solution to the given problem using AVL Trees. https://www.hackerrank.com/contests/17cs1102/challenges/10-c-avl-tree-delete https://www.hackerrank.com/domains/data-structures?filters%5Bsubdomains%5D%5B%5D=balanced-trees	CO1, CO2, CO3, CO4
4	a) Implement 2-3 Trees and its operations. b) Develop a solution to the given problem using 2-3 Trees. https://leetcode.com/tag/tree/	CO1, CO2, CO3, CO4
5	a) Implement disjoint sets and its operations. b) Develop a solution to the given problem by using Disjoint set. https://www.hackerrank.com/domains/data-structures?filters%5Bsubdomains%5D%5B%5D=disjoint-set	CO1, CO2, CO3, CO4
6	a) Construct a graph from given degrees of all vertices b) Find K vertices in the graph which are connected to at least one of remaining vertices c) Find the remaining vertices of a square from two given vertices	CO1, CO2, CO3, CO4
7	Develop a solution to the given graph problem by choosing an effective algorithm. https://leetcode.com/tag/graph/ https://www.hackerrank.com/domains/algorithms/graph-theory/page/1	CO1, CO2, CO3, CO4
8	Develop a solution to search for a pattern string using String Search Techniques. https://www.hackerrank.com/domains/algorithms/strings/page/2 https://leetcode.com/tag/string-matching/	CO1, CO2, CO3, CO4
9	Use case-1	CO1, CO2, CO3, CO4
10	Use case-2	CO1, CO2, CO3, CO4

Learning Resources

Text Books

1. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, Fourth Edition, 2014, Pearson.
2. Introduction to Algorithms, Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Third Edition, 2009, The MIT Press.

References

1. Advanced Data Structures, Reema Thareja, S. Rama Sree, Oxford University Press, 2018.
2. Data Structures and Algorithms Made Easy by Narasimha Karumanchi, 2020, CareerMonk Publications.
3. Advanced Data Structures, Peter Brass, Cambridge University Press, 2008.

e-Resources and other Digital Material

1. <https://www.youtube.com/playlist?list=PLBlnK6fEyqRj9lld8sWIUNwlKfdUoPd1Y>.
2. <http://ocw.mit.edu/6-851S12/>
3. <https://nptel.ac.in/courses/106/106/106106133/>
4. <https://www.mooc-list.com/course/advanced-data-structures-edx>