PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY(Autonomous)
KANURU, VIJAYAWADA

Department of CSE (DATA SCIENCE)
II B.Tech – II Semester

Advanced Competitive Programming

Course Code	20SO8456	Year	II	Semester	II
Course Category	SOC2	Branch	CSE(Data Science)	Course Type	Theory
Credits	2	L-T-P	1-0-2	Prerequisites	Foundations of Competitive Programming, Data Structures
Continuous Evaluation :	-	Semester End Evaluation:	50	Total Marks:	50

Syllabus – Course Contents	
Week 1	• Apply Binary Tree concepts to solve the Level Order Print, Tree Diameter Concept, Tree Diameter Optimized Code, Replace with Descendant Sum, Height of Tree, Height Balanced Tree Concept, Max Subset Sum Tree, Print At Level K, Nodes at Distance K, Nodes at Distance K Code, Vertical Order Print, Sorted Nodes at Distance K, Siblings Swap problems.
Week 2	Exercise problems on Binary Trees: • https://www.hackerrank.com/domains/datastructures?filters%5Bsubdomains%5D%5B%5D=trees • https://www.hackerearth.com/practice/data-structures/trees/binary-and-nary-trees/practice-problems/
Week 3	• Apply Binary Search Tree concepts to solve Minimum Height BST, Closest in BST, In order Successor in BST, IsBST, LCA, Shortest Tree Path
Week 4	Exercise problems on Binary Search Trees: • https://www.hackerearth.com/practice/data-structures/trees/binary-search-tree/practice-problems/ • https://www.hackerrank.com/domains/datastructures?filters%5Bsubdomains%5D%5B%5D=trees
Week 5	• Apply Priority Queue concepts to solve Sorting using Heap, Finding Cabs Implementation, Merging Ropes, Running Median, Running Median Class, Merging K-Arrays, Merge K-Sorted Arrays, problems
Week 6	Exercise problems on Priority Queue: • https://www.hackerrank.com/domains/datastructures?filters%5Bsubdomains%5D%5B%5D=heap • https://www.hackerearth.com/practice/data-structures/trees/heapspriority-queues/practice-problems/
Week 7	• Apply Hashing technique to solve Triplets in GP, Hashing with Slider, Triplets in GP Implementation, Counting Rectangles	Sets, Counting Rectangles Implementation, Counting Triangles	Unordered Maps, Counting Triangles Implementation, Anagrams in Substrings	Maps, Anagrams in Substrings Implementation Quick Brown Fox Implementation, Common Elements, First Repeating Letter, Break the chain, Minimum Bars, Group Anagrams, Longest k-sum Subarray problems
Week 8	Exercise problems on Hashing Technique: • https://www.hackerearth.com/practice/data-structures/hash-tables/basics-of-hash-tables/practice-problems/
Week 9	• Apply Graph data structure to solve Cycle Detection in Undirected Graph, Backedge Detection, Cycle Detection in Directed Graph, Board Game Implementation, Storing Weighted Graphs, Astronaut Pairs, Graph Sequence, Largest Island, Shortest Grid Path, Minimum Spanning Trees, Kruskal Algorithm Prims Algorithm, Explaining Dijkstra Algorithm, Bellman-Ford Algorithm and Floyd-Warshall Algorithm, Bipartite Graph Test

Week 10	Exercise problems on Graph data structure: • https://www.hackerrank.com/domains/algorithms?filters%5Bsubdomains%5D%5B%5D=graph-theory • https://codeforces.com/ • https://www.codechef.com/
Week 11	Apply Divide and Conquer to solve the problems • https://codeforces.com/ • https://www.codechef.com/ • https://leetcode.com/
Week 12	Apply Greedy Algorithms to solve the problems • https://www.hackerearth.com/practice/algorithms/greedy/basics-of-greedy-algorithms/practice-problems/ • https://www.hackerrank.com/domains/algorithms?filters%5Bsubdomains%5D%5B%5D=greedy • https://codeforces.com/ • https://www.codechef.com/ • https://leetcode.com/
Week 13	Apply Back Tracing Technique to solve the problems • https://codeforces.com/ • https://www.codechef.com/ • https://leetcode.com/
Week 14	Apply Dynamic Programming to solve the problems • https://www.hackerrank.com/domains/algorithms?filters%5Bsubdomains%5D%5B%5D=greedy&filters%5Bsubdomains%5D%5B%5D=dynamic-programming
Week 15	Apply Dynamic Programming to solve the problems • https://www.hackerearth.com/practice/algorithms/dynamic-programming/introduction-to-dynamic-programming-1/practice-problems/ • https://www.codechef.com/practice?end_rating=1199&group=all&itm_campaign=practice&itm_medium=navmenu&limit=20&page=0&search=&sort_by=difficulty_rating&sort_order=asc&start_rating=1000&tags=&topic=Dynamic%20Programming&video_editorial=0&wa_enabled=0
Week 16	Case Study

LEARNING RESOURCES

Text Books

1. Guide to Competitive Programming; Learning and improving Algorithms Through Contests, Antti Laaksonen, Second Edition, 2020, Springer.
2. Programming Challenges: The Programming Contest Training Manual, Steven S. Skiene, 2006, Springer.
3. Introduction to Algorithms, Thomas H. Cormen, Third Edition, 2009, PHI Learning Pvt. Ltd.

e-Resources & other digital material

1. https://www.hackerrank.com
2. https://www.hackerearth.com
3. https://www.codeforces.com
4. https://www.codechef.com
5. https://www.leetcode.com
6. https://www.interviewbit.com
7. https://www.topcoder.com
8. https://www.geeksforgeeks.com
9. https://www.codewars.com