PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY

KANURU, VIJAYAWADA

Department of CSE (DATA SCIENCE)

II B.Tech – I Sem

Foundations of Competitive Programming

Course Code	20SO8357	**Year**	II	**Semester**	I
Course Category	SOC1	**Branch**	CSE (Data Science)	**Course Type**	Theory
Credits	2	**L-T-P**	1-0-2	**Prerequisites**	Programming for Problem Solving using C
Continuous Internal Evaluation :	-	**Semester End Evaluation:**	50	**Total Marks:**	50

Syllabus – Course Contents	
Week 1	• Apply time and space complexity on Pseudo code • Identifying the Test cases and corner cases • Exercise: https://www.interviewbit.com/courses/programming/time-complexity
Week 2	• Exercise: Fill in the missing code, Code Magnets, Be the Compiler, Crosswords, Mixed Messages, and Pool Puzzle for analysis flow of code execution.
Week 3	• Implement programs using C++ Standard Template Library (STL): Containers, Iterators, functions, Algorithms
Week 4	• Apply STL to implement Vectors, Strings, Lists & Forward Lists operations
Week 5	• Apply STL to implement Stacks, Queue, Maps, Unordered maps, Set operations
Week 6	• Apply all basic bitwise operators like (OR, AND, NOT, XOR, Left Shift and Right Shift) and properties of each of these operators. Bitwise operations: Get & Set bits, clear & update bits, clear range of bits, replace bits in N by M, count set bits, bit masking • Exercise:https://www.hackerrank.com/domains/algorithms?filters%5Bsubdomains%5D%5B%5D=bit-manipulation
Week 7	• Apply binary search concepts to solve the problems
Week 8	• Apply recursion to generating all subsets and all Permutations and Logic building of Combination sum Problem
Week 9	• Apply Strings and Pattern Matching, Rabin-Karp Algorithm, Longest Prefix Suffix and KMP & Z-Algorithm, Suffix Array, and LCP Array to solve the problems
Week 10	• Apply liked list concepts to solve Recursive Reverse a Linked List, Iterative Reverse, Merge Two Sorted Linked Lists, Merge Sort on Linked List, Search, Middle Element, K-th list, Detect Cycle in a Linked List
Week 11	• Exercise problems on Linked List: ➢ https://www.hackerrank.com/domains/datastructures?filters%5Bsubdomains%5%5B%5D=linked-lists ➢ https://www.hackerearth.com/practice/data-structures/linked- list/singly-linked-list/practice-problems/
Week 12	• Apply stacks data structures to solve Balanced Parenthesis, Redundant Parenthesis, largest Rectangle, simple text editor

Week 13	• Exercise problems on Stacks : ➢ https://www.hackerrank.com/domains/data-structures?filters%5Bsubdomains%5D%5B%5D=stacks ➢ https://www.hackerearth.com/practice/data-structures/stacks/basics-of-stacks/practice-problems/
Week 14	• Apply Queue data structures to solve Queue using two stacks, Max Subarray (Sliding Window + Deque), Simplify Path, Simplify Path Code, Stock Span Problem, First Non-Repeating Character, Simplify Path
Week 15	• Exercise problems on Queues: ➢ https://www.hackerrank.com/domains/data-structures?filters%5Bsubdomains%5D%5B%5D=queues ➢ https://www.hackerearth.com/practice/data-structures/queues/basics-of-queues/practice-problems/
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