



Birla Institute of Technology & Science, Pilani

Pilani Campus

Centre for Software Development, SDET
Unit

Course Handout: First Semester 2019-2020

Course No:

Course Title: Introduction to Competitive Programming

Instructor-in-Charge: Bhavik Dhandhalya [dhandhalyabhavik@gmail.com]

Hours:

Room:

- 1. Objective and scope of the course:** The main objective of this course is to teach everyone how to approach a problem during competitive programming and an interview. Moreover, How to decide the best data structure with optimal algorithm for a given problem.
- 2. Learning Outcome:** By the end of the course participants shall be able to identify, deduce and optimize a wide variety of problems. This course shall help them get a headstart in competitive programming.
- 3. Course Material :**
 - Participants shall be provided with **specific set of problems** [from codechef, codeforces, hackerrank, interviewbit, geeksforgeeks] for every domain during lectures. Mainly 3 problems will be discussed during classes and 3 to 5 will be given as homework for practice.

4. Course Plan:

Lec	Topic(s)	HomeWork
1	<ul style="list-style-type: none">- Brief intro about Course course content- Online judges for practice- How to prepare for coding interviews ?- Do's & Don'ts for Competitive programming(CP) & Interview	
2	<ul style="list-style-type: none">- STL libraries required for competitive programming	
3	<ul style="list-style-type: none">- Arrays & Sorting- Introduction to Arrays & Sorting algorithms- Arrangement based problems- Prefix Sum based problems- Bucketing based problems- Comparator based sorting problems	5+ problems
4	<ul style="list-style-type: none">- Two pointers- Basics of Two pointers- Problems involving simultaneous iteration to achieve optimality.	3+ problems

5	<ul style="list-style-type: none"> - Binary Search - Basics of Binary Search Algorithm - Lower, upper bound based problem - Binary search on answer based problems - Binary search on modified sort based problems - Binary search on matrix based problems 	3+ problems
6	<ul style="list-style-type: none"> - Linked List - Implementing Linked List - List two pointer based problems - Linked list math based problems 	3+ problems
7	<ul style="list-style-type: none"> - Hashing - Introduction to different hashing techniques - Hashing + two pointers based problems - math + hashing based problems - cloning a data structure based problems 	5+ problems
8	<ul style="list-style-type: none"> - Stack & Queue - Introduction to Stack & Queue data structure - Introduction to Double ended Queue data structure 	3+ problems
9	<ul style="list-style-type: none"> - String - Basics of String - validation of string based problem - constructive algorithm/hard implementation based problems - KMP string matching based problem 	3+ problems
10	<ul style="list-style-type: none"> - Bit Manipulation - Basic bit operations - XOR based problems - bit masking technique based problems 	2+ problems
11	<ul style="list-style-type: none"> - Greedy - Introduction to greedy algorithms 	4+ problems
12	<ul style="list-style-type: none"> - Heap - Introduction to heap data structure - Min heap and Max heap based problems 	3+ problems
13	<ul style="list-style-type: none"> - Math - GCD based problems - Fast Exponentiation based problems - Permutation, Combination, Number theory based problems 	4+ problems
14-15	<ul style="list-style-type: none"> - Trees - Introduction to Trees and their coding representations - Tree construction based problems - Tree Search based problems - Traversal based problems 	10+ problems
16-17	<ul style="list-style-type: none"> - Graphs - Introduction to graphs and their coding representations 	5+ problems

	<ul style="list-style-type: none"> - BFS, DFS based problems - Cycle Detection based problems - Connected Components based problems - Strongly Connected Components based problems 	
18	<ul style="list-style-type: none"> - Trie - Introduction to trie data structure - Construction of Trie data structure 	2+ problems
19-20	<ul style="list-style-type: none"> - Dynamic Programming - Introduction to Dynamic Programming - Simple 1D DP problems - matrix based DP problems - 2D DP problems - Classical DP on Tree problem 	10+ problems

Component	Duration	Type	Max Marks	Date
Homework	-	Open Book	40	-
Online Test - 1	2 Hr	Closed Book	20	-
Online Test - 2	2 Hr	Closed Book	20	-
Online Test - 3	2 Hr	Closed Book	20	-

5. Evaluation Scheme: To be discussed in the class

6. Make-up policy: Only in genuine cases, on a case-by-case basis, Make-ups shall be allowed.

7. Instructor's Profile:

- I secured 64th rank in ACM ICPC 2016 Kolkata regional onsite after competing with 900+ teams.
- I also participated in ACM ICPC 2015 Amritapuri regional onsite after competing with 1500+ teams.
- 4 year of competitive programming experience
- I was a founder of "The programming Club" in my B.Tech and trained my juniors for programming.

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