ACA'24

MASTERING ALGORITHMS

Mentors

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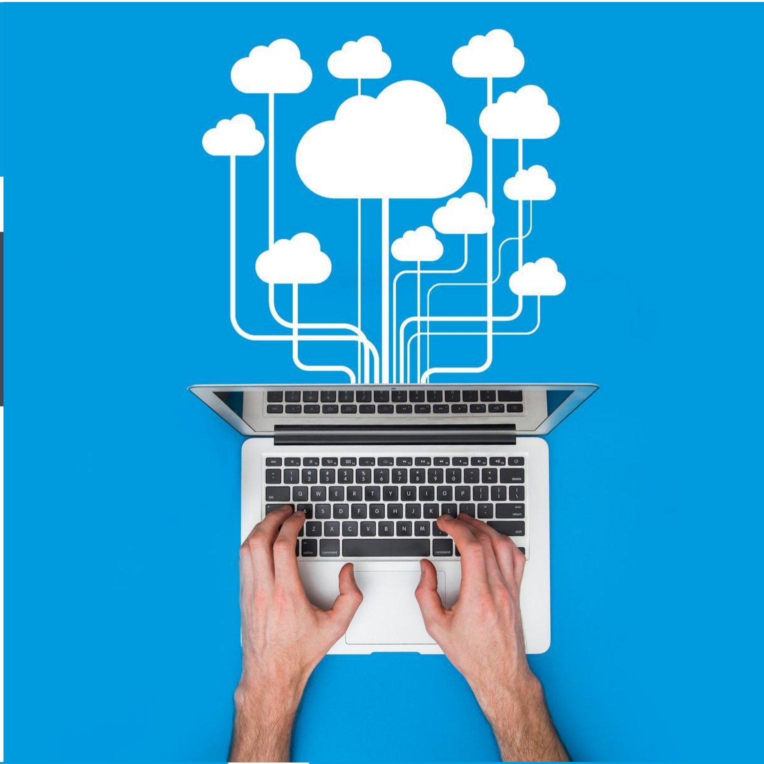

Motivation(WHY ?)

"Algorithms are the building blocks of problem-solving"

- Algorithmic problem solving is important in many areas of modern life, from hard and soft sciences to art and entertainment, especially in Computer Science.
- Enhances critical thinking and Algorithmic Problem solving Skills.
- Helpful in Placements - Being experienced in competitive programming , gives an edge during coding rounds of job interviews.

Learning Outcomes

The project aims to:

- ➢ Introduce efficient Algorithmic Problem Solving methods.
- ➢ Enhance problem-solving skills through competitive programming challenges and math puzzles.
- ➢ Explore the applications of number theory, graph theory, and combinatorics to solve complex problems efficiently.
- ➢ Delve into frequently used algorithms and techniques in competitive programming and algorithmic puzzles for a deeper understanding.

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Topics

Week Distribution

Methodology

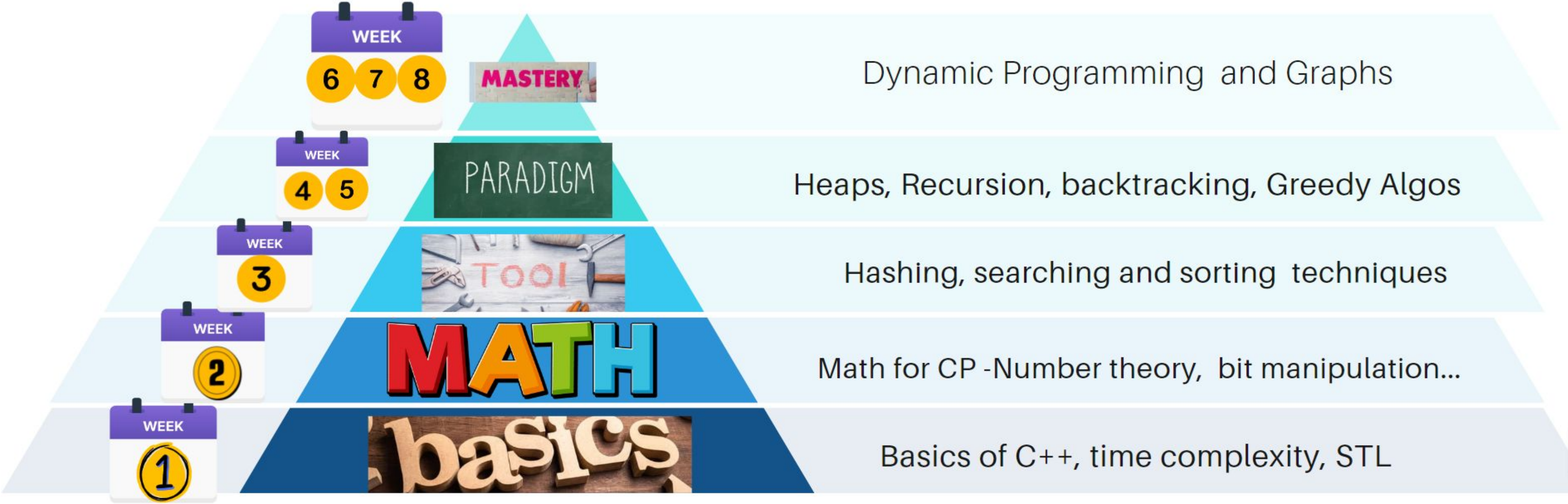
Evaluation Criteria

Our Team

Topics

- Week 1: Basics of C++ , time complexity, STL
- Week 2: Modular Arithmetic, Sieve of Eratosthenes , Theorems in number theory, bit manipulation, Constructions
- Week 3: Hashing, searching and sorting
- Week 4 and Week 5 : Heaps, Recursion, Greedy Algos
- Week 6 and Week 7: Dynamic Programming
- Week 7 and Week 8: Graph Algorithms

Topics and Timeline



Dynamic Programming and Graphs

Heaps, Recursion, backtracking, Greedy Algos

Hashing, searching and sorting techniques

Math for CP -Number theory, bit manipulation...

Basics of C++, time complexity, STL

Week 1

- Basic concepts of C++
- Time complexity in programming
- Introduction to vectors
- Introduction to Stacks and problems related to stacks .
- Introductions to Queues and related problems.

Week 2

- Number theory
- Primes and Modular arithmetic
- Bit manipulations
- Basic Combinatorics
- Game theory
- Probability

Week 3

- Brute force, Divide and conquer
- Sorting and Searching algorithms
- Hashing
- Sliding window
- Two pointer method

Week 4 and Week 5

- Introduction to Heaps
- Advanced concepts in heaps
- Recursion
- BackTracking
- Greedy Algorithms

Week 6

- Introduction to dynamic programming
- Recursion problems using dynamic programming
- Solving greedy problems using dynamic programming
- Travelling salesman using dp
- Longest common subsequence problem
- Knapsack Problem

Week 7 and Week 8

- Basics of graphs
- Adjacency lists
- BFS and DFS Traversal
- Theoretical discussion as well as code implementation
- Dijkstra's Algorithm
- Spanning Trees

Methodology

- Step 1: Theoretical description of the concept using examples
- Step 2: C++ code implementation of the problem
- Step 3: Reference material for students to refer to for additional clarity in the topic.
- Step 4: Topicwise codeforces/leetcode/hackerRank/geeksforgeeks weekly problems with deadline.
- Step 5: Doubt sessions and active whatsapp participation

An Algorithmic Puzzle every alternate day, typically have the flavor of Project Euler

Evaluation Criteria

1) Weekly assignment/practice problems
2) 2 major programming assignments – one before midterm and one before end term
3) Mid term and End term Report

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THANK YOU!