

Coding Geeks

This is a **beginner program** designed specifically for engineering students are new to programming and want to start their journey in to the **world of competitive programming**. This program will build **strong programming foundation** and prepare students to compete at next level and start solving complex problems which are frequently asked in programming interviews.

Program skills: Algorithm Design, Programming, Data Structures and Problem Solving Skills

Who should join this course?

- Entry level industry professionals who are in service company and want to switch to a product or e-commerce company.
- B.Tech (CS, IT, ECE) or MCA 1st, 2nd and 3rd year students who are new to programming and want to start their journey in to the world of competitive programming.

Program Fee: 10000/- per student

Venue: IT Bodhi, 2F, Ajnara Arcade, Crossing Republic, Ghaziabad, UP, 201016

Prerequisites: Passion for algorithms and coding

Program Features:

- Program duration: 8 Weekends(32 hours)
- Class schedule: 2 session per weekend(Saturday and Sunday)
- Class duration: 2 hours per session
- Interactive classes
- Weekly problem assignments on learned concepts
- Daily hands on coding
- Performance assessment tests
- Mock Interviews
- Support web center : discussion forum, Blogs

Program Detail:

- Every class will consist of lectures on following categories:
 1. General Concepts and Programming Fundamentals
 2. Data Structures and Algorithms
 3. Hands On Problems and Programs

Week1 (4 hours):

1. General Concepts and Programming Fundamentals

- Importance of Algorithms and Data Structures
- Elements of a Program
- Functions
- Nested Loops
- Iteration & Recursion

2. Data Structures and Algorithms

- Elementary Data Structures
- Array 1D/2D
- Understanding complexity(time/space) of an algorithm/program
- Asymptotic analysis including big-O notation
- Time and Space Complexity

3. Hands On Problems and Programs

- Introduction to Problem Solving Techniques
- Introduction to Online Coding Platforms like HackerRank

Week2 (4 hours):

1. General Concepts and Programming Fundamentals

- Dynamic allocation of memory
- Understanding execution of Recursive functions
- Recursion Termination Conditions
- Introduction to Object Oriented Programming
- Structure in C
- Pointers in C

2. Data Structures and Algorithms

- Strings
- Recursion

3. Hands On Problems and Programs

- Solving complex problems based on learned concepts
- Discussing Technical Interview problems

Week3 (4 hours):

1. General Concepts and Programming Fundamentals

- Important Design Patterns
- Design patterns for real time problems
- Designing a solution

2. Data Structures and Algorithms

- Queues
- Linked List
- Stacks

3. Hands On Problems and Programs

- Solving complex problems based on learned concepts
- Discussing Technical Interview problems

Week4 (4 hours):

1. General Concepts and Programming Fundamentals

- Object Oriented Design Principles

2. Data Structures and Algorithms

- Sorting techniques
- Selection Sort
- Bubble Sort
- Insertion Sort
- Merge Sort
- Divide-and-conquer algorithms for sorting

3. Hands On Problems and Programs

- Solving complex problems based on learned concepts
- Discussing Technical Interview problems

Week5 (4 hours):

1. General Concepts and Programming Fundamentals

- Probability Theory and Randomness
- Principles of Induction

2. Data Structures and Algorithms

- Quick Sort
- Heap Sort
- Counting Sort
- Radix Sort/ Bucket Sort
- Shell Sort
- External Sort
- Searching Techniques

3. Hands On Problems and Programs

- Solving complex problems based on learned concepts
- Discussing Technical Interview problems

Week6 (4 hours):

1. General Concepts and Programming Fundamentals

- Permutation and Combination
- Probability

2. Data Structures and Algorithms

- Binary Tree
- Selection Algorithms(like find median)
- Divide & Conquer approach

3. Hands On Problems and Programs

- Solving complex problems based on learned concepts
- Discussing Technical Interview problems

Week 7-8 (8 hours):

- Live Coding Contests
- Interview/Resume Preparation
- Mock Interviews
- Exhaustive problem solving sessions

A sample set of technical problems based on basic data structures to be discussed during the program:

Array:

1. Print a given Matrix in spiral form.
2. Given an array of 0s and 1s . You need return the index of a zero turning which will produce a longest continuous 1s
3. Given an array that is first increasing then decreasing, find the element where it start decreasing.
4. Given an array that contains only 1, 2 and 3. Sort the array. Try Dutch National Flag algorithm or 3-way Partitioning
5. Given two rectangles, find if the given two rectangles overlap or not.
6. Given a text txt[0..n-1] and a pattern pat[0..m-1], write a function search(char pat[], char txt[]) that prints all occurrences of pat[] in txt[]. You may assume that $n > m$. Read KMP (Knuth Morris Pratt) Pattern Searching
7. Search an element in a sorted and rotated array
8. Implement Queue using Stacks
9. Print all continuous sub array (size more than one) of an integer array of size N.
10. You have an integer array of size N. Rotate it by k elements to left side, where $i < N$.
11. Given an array of random numbers, Push all the zero's of a given array to the end of the array.
12. You have two sorted integer arrays of same size N. Find the median of these two arrays.

String:

1. Write a code to reverse the words in a sentence
2. Check if two given strings are isomorphic to each other
3. Remove spaces from a given string in $O(n)$ time and without extra space.
4. Write a function to check whether two given strings are anagram of each other or not.
5. Given three strings A, B and C. Write a function that checks whether C is an interleaving of A and B.
6. Given a string, find its first non-repeating character
7. Write a program to print all permutations of a given string
8. Print reverse of a string using recursion
9. Write an efficient C program to print all the duplicates and their counts in the input string

Linked list:

1. Write code to reverse a singly link list and write code to reverse the nodes from $(n-x)^{th}$ node.
2. Write code of merge sort for two singly linked list.
3. Write code to find if given singly link list has any loop in it and also find length of the loop.
4. Write code to find k^{th} element from the end in a singly link list.
5. Two given singly list are merged at any point(node) and make a Y shape. Length of both the linked list are different. Find the value at merging node.
6. Check if there is a loop in linked list.

Tree:

1. In a binary tree, find and print the path with smallest weight.
2. Merge two BSTs with limited extra space
3. Print Common Nodes in Two Binary Search Trees
4. Print all nodes that are at distance k from a leaf node
5. Find distance between two given keys of a Binary Tree
6. Check if all leaves are at same level in a binary tree

7. Given a Binary Tree, write a function to check whether the given Binary Tree is Complete Binary Tree or not.
8. Write code to determine if two given trees are identical i.e they have identical data and so as its arrangement.
9. Write code to find the maximum depth or height of a tree.
10. Write code to count leaf nodes in a binary tree.
11. Write code to print spiral order traversal of a tree(spiral form)
12. Write code to print diameter of a Binary Tree.
13. Write code to determine if two given trees are mirror image of each other.
14. Write code to Print Ancestors of a given node in Binary Tree.

A little sample set of logical problems to be discusses during the program:

- 1- You are blindfolded and 10 coins are placed in front of you on table. You are allowed to touch the coins, but by feel you can't tell which way they are up. You are told that there are 5 coins head up, and 5 coins tails up but not which ones are which. How do you make two set of coins, each with the same number of heads up? You can flip the coins any number of times.
- 2- A man has two cubes at his desk. Every day he arranges both cubes so that the front faces show the current day of the month. What numbers are on the faces of the cubes to allow this?
- 3- You have 100 doors in a row that are all initially closed. You make 100 passes by the doors starting with the first door every time. First time through you visit every door and toggle the door (if the door is closed, you open it, if it's open, you close it). The second time you only visit every 2nd door and toggle it (door #2, #4, #6). The third time, every 3rd door and toggle it (door #3, #6, #9), etc., until you only visit the 100th door. Tell the door's no which will remain open after all this. (like 4th ..)
- 4- There are 25 horses in a racing competition. You can have race among 5 horses in a particular race. What would be the minimum number of races that will be required to determine the 1st, 2nd and 3rd fastest horses?
- 5- There is a building of 100 floors If an egg drops from the Nth floor or above it will break If it's dropped from any floor below, it will not break You're given 2 eggs Find N, while minimizing the number of drops for the worst case.
- 6- There are 3 baskets. One of them has apples, one has oranges only and the other has mixture of apples and oranges. The labels on their baskets always lie. (i.e. if the label says oranges, you are sure that it doesn't have oranges only, it could be a mixture) The task is to pick one basket and pick only one fruit from it and then correctly label all the three baskets. How do you do it?
- 7- Pairs of primes separated by a single number are called prime pairs. Examples are 17 and 19, 5 and 7 etc.. Prove that the number between a prime pair is always divisible by 6 (assuming both numbers in the pair are greater than 6). Also prove that there are no 'prime triples'.
- 8- You have 16 players. you have to arrange a match between two players to find out which one better. How many minimum matches you needs to arrange to find the second best player. Extend your approach to find second best among N players.
- 9- A candidate is selected for interview for 3 posts. The number of candidates for the first, second, third posts are 3,4,5 respectively. what is the probability of his getting at least one post?
- 10- There is a country, where every family wants a girl. So each family continues having babies till they have a girl in their family. So what would be the ratio of male & female in that country.
- 11- An executioner lines up 100 prisoners into single line and puts a red or a blue hat on each prisoner's head. Every prisoner can see the hats of the people in front of him in the line - but not his own hat, nor those of anyone behind him. The executioner starts at the end (back) and asks the last prisoner the color of his hat. He must answer "red" or "blue." If he answers correctly, he is allowed to live. If he gives the wrong answer, he is killed instantly and silently. (While everyone hears the answer, no one knows whether an answer was right.) On the night before the line-up, the prisoners confer on strategy. What would be their strategy to save maximum among themselves.

12. There are $(n+1)$ people in a party, they might or might not know each other's names.

There is one celebrity in the party. Celebrity does not know any of n people by name and all n people know celebrity by name. You are given the list of people's names $(n+1)$, You can ask only one question from the people. Do you know this name? How many maximum number of questions you need to ask to know the celebrity name?

Note: assume all names are unique. and you know the persons by name (but don't know if he is celebrity)

13. 500 men are arranged in an array of 10 rows and 50 columns according to their heights. Tallest among each row of all are asked to come out. And the shortest among them is A. Similarly after resuming them to their original positions, the shortest among each column are asked to come out. And the tallest among them is B. Now who is taller A or B?

14. There are 20 priests in a temple. One day, Lord Shiva appears before them and tells them that some of them have sinned, and that a black spot would appear on the forehead of all the priests who have sinned. The priests are not allowed to look into a mirror or communicate with each other. When any priest finds out that there is a spot on his forehead, he should leave the temple on that day itself. At least 1 priest has sinned. How can a priest find out whether he has a spot on his forehead. What would be the pattern of the priests leaving the temple?