CODING NINJAS

COMPETITIVE PROGRAMMING

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OVERVIEW

This course will help you to learn how to write the most efficient programs using the advanced data structures and algorithms. Also, it will train you to perform under pressure and improve your problem solving skills which are the sought after skills for top tier companies.

FEATURES

LIVE MENTOR SUPPORT & STUDENT EXPERIENCE TEAM

WANT A BREAK? PAUSE YOUR COURSE

GET AN INDUSTRY RECOGNISED CERTIFICATE

BE A PART OF THE INDUSTRY COMMUNITY

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COMPANIES HIRING

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COURSE OFFERINGS

BASIC

- Competitive Programming

STANDARD

- Introduction to Programming
- Data structures and algorithms
- Competitive Programming

PRO

- Competitive Programming
  - 10 industry mentor sessions
  - Resume Building Workshops
  - Help in profile building
  - 100+ curated interview problems
  - DSA mock test series to crack product companies

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- **Introduction to Programming**
- **Data structures and Algorithms**
- **Competitive Programming**

  - 10 industry mentor sessions
  - Resume Building Workshops
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  - 100+ curated interview problems
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INTRODUCTION TO PROGRAMMING

Learn the basics of the most popular programming languages (C++ /Java / Python) and become an expert in the core fundamentals of programming.

DATA STRUCTURES AND ALGORITHMS

Data structures and algorithms is all about organizing the information and finding the most efficient approach to solve a problem. Learning these concepts will in turn help you to improve your problem-solving skills and solve any real-world problems using technology.

COMPETITIVE PROGRAMMING

You will learn how to approach or solve a given problem in the most efficient way and practice challenging problems using the concepts of data structures and algorithms. Some of the advanced topics include Range queries, Number theory, Computational geometry etc.

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INTRODUCTION TO PROGRAMMING

TOPIC	SUB-TOPICS	DETAILS
BASICS OF PROGRAMMING	Flowcharts	Introduction to flow-charts, Decision making using flowcharts, Loops, Example problems
	Variables and Data types	First program, Variables and data types, Taking input, How data is stored in memory, Arith-metic Operators
	Conditional statements	Introduction to If else, Relational and logical operators, Nested conditionals
LOOPS AND FUNCTIONS	While loops	While loops, Flow of execution of statements in while loop, Example problems using while loop
	Patterns	Introduction to patterns, Basic Patterns, Square Patterns, Triangular Patterns, Character Patterns, Reverse Triangle, Inverted patterns, Isosceles triangles

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TOPIC	SUB-TOPICS	DETAILS
LOOPS AND FUNCTIONS	For loops	For loops, Break and Continue, increment - decrement operators
	Functions	Introduction to functions, Working of function calling, Variables and its scope, Pass by value
ARRAYS	Introduction to arrays	Introduction to arrays, How arrays are stored in memory, Passing arrays to functions
	Searching and Sorting	Understanding Binary Search, Selection sort, Bubble sort, Insertion sort, Merging two sorted arrays
STRINGS AND 2D ARRAYS	Strings	Introduction to strings, storage of strings and their inbuilt functions
	2D Arrays	2D arrays, Storage of 2D arrays, Example problems using 2D Arrays

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DATA STRUCTURES AND ALGORITHMS

TOPIC	SUB-TOPICS	DETAILS
PROBLEM SOLVING TECHNIQUES	Recursion	Introduction to recursion, Principle of mathematical induction, Fibonacci numbers, Recursion using arrays, Recursion using strings, Recursion using 2D arrays
	Time and space complexity	Order complexity analysis, Theoretical complexity analysis, Time complexity analysis of searching and recursive algrithms, Theoretical space complexity, Space complexity analysis of merge sort
OBJECT-ORIENTED PROGRAMMING	Basics of OOP	Introduction to oops, Creating objects, Getters, and setters, Constructors and related concepts, Inbuilt constructor and destructor, Example classes
	Advance concepts of OOP	Static members, Function overloading and related concepts, Abstraction, Encapsulation, Inheritance, Polymorphism, Virtual functions, Abstract classes, Exception handling

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TOPIC	SUB-TOPICS	DETAILS
LINEAR DATA STRUCTURES	Linkedlists	Introduction to linked list, Inserting node in linked list, Deleting node from linked list, Midpoint of linked list, Merge two sorted linked lists, merge sort of a linked list, Reversing a linked list
	Stacks and Queues	Introduction to stacks, Stack using arrays, Dynamic Stack class, Stack using linked list, Inbuilt stack, Queue using arrays, Dynamic queue class, Queue
TREES	Generic Trees	Introduction to Trees, Making a tree node class, Taking a tree as input and printing, Tree traversals, Destructor for tree node class
	Binary Trees	Introduction to Binary Trees, Taking a binary tree as input and printing, Binary Tree traversals, Diameter of binary tree

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TOPIC	SUB-TOPICS	DETAILS
TREES	Binary Search Trees	Introduction to Binary Search Trees, Searching a node in BST, BST class, Inserting and Deleting nodes in BST, Types of balanced BSTs
ADVANCED DATA STRUCTURES	Priority Queues	Introduction to Priority Queues, Ways to implement priority queues, Introduction to heaps, Introduction to Complete Binary Trees and its implementation, Insert and Delete operations in heaps, Implementing priority queues, Heap sort, Inbuilt Priority Queue
	Hashmaps	Introduction to Hash-maps, Inbuilt Hashmap, Hash functions, Collision handling, Insert and Delete operation implementation in hashmap, Load factor, Rehashing
	Tries	Introduction to Tries, Making a Trie Node class, Insert, Search and Remove operation implementation in Tries, Types of Tries, Huffman Coding

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TOPIC	SUB-TOPICS	DETAILS
ADVANCED DATA STRUCTURES	Graphs	Introduction to Graphs, Graph Terminology, Graph implementation, Graph Traversals (DFS and BFS), Weighted and Directed Graphs,Minimum Spanning Trees, Cycle Detection in Graphs, Kruskal's algorithm, Prim's Algorithm, Dijkstra's algorithm
DYNAMIC PROGRAMMING	Introduction to Dynamic Programming	Introduction to Memoization, Introduction to Dynamic Programming, Fibonacci numbers using recursion, memoization and dynamic programming
	Applications of Dynamic Programming	Longest Common Subsequence (LCS) using recursion, memoization and dynamic programming, Edit distance using recursion, memoization and dynamic programming, Knapsack problem using recursion, memoization and dynamic programming

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COMPETITIVE PROGRAMMING

TOPIC	SUB-TOPICS	DETAILS
BASICS OF COMPETITIVE PROGRAMMING	Introduction to Competitive Programming	Why Competitive Programming?, How To Approach A Problem In Contest, Various Types of Errors
	Basics Of Recursion	Introduction to Recursion, Recursion and PMI, Fibonacci Number, Recursion and Arrays
	Time and Space Complexity Analysis	Order Complexity Analysis, Theoretical Analysis, Linear Search time complexity, Insertion Sort time complexity, Selection Sort time complexity, Theoretical Analysis - Recursive Algorithms, Merge Sort Time complexity,Fibonacci Time Complexity Analysis, Space Complexity Analysis, Merge Sort Space Complexity Analysis, Fibonacci Space Complexity Analysis, Kadane's Algorithm

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TOPIC	SUB-TOPICS	DETAILS
BASICS OF COMPETITIVE PROGRAMMING	Language Tools	STL - Data Structures, STL - Functions, Hussain Set, Voters List, Permutation & Palindrome
	Searching & Sorting Applications	Aggressive Cows, Inversion Count
APPLICATIONS OF RECURSION	Advanced Recursion	Recursion and Strings, Merge Sort Algorithm, Quick Sort Algorithm, Strings, Return Subsequences of a String, Return Keypad Approach
	Backtracking	Backtracking (N-Queen), N-Queen Code, Rat In A Maze code

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TOPIC	SUB-TOPICS	DETAILS
BIT MANIPULATION AND MODULO ARITHMETIC	Bit Manipulation	Flip i^{th} bit, Check Odd-Even, Introduction & Shift Operators, Clear All Bits From LSB, Remaining Bitwise Operators, Check Power of 2, Check nth bit
	Modulo Arithmetic	Modulo Operations, Modulo Properties, Modulo Operations - Continue, Number Of Balanced Binary Trees
DYNAMIC PROGRAMMING	Dynamic Programming	Basics Of Dynamic programming: Fibonacci Numbers, AlphaCode, Longest Increasing Subsequence, Coin Change And StairCase, Minimum Cost, Magic Grid, Maximum Sum Rectangle, Longest Common Subsequence, Knapsnack - Iterative, Subset Sum
	Greedy Problems	Introduction To Greedy Techniques, Minimum Absolute Difference In Array, Nikunj And Donuts, Fractional Knapsack, Weighted Job Scheduling

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TOPIC	SUB-TOPICS	DETAILS
DYNAMIC PROGRAMMING	DP & Bitmasking	DP With Bitmasking, What is Bit Masking?, Minimum Cost for Jobs, Mehta and Bank Robbery
RANGE QUERIES	Segment Tree	Introduction to Segment Tree, Update On A Segment Tree, Size Of Segment Tree, Sum Of Squares Video Maxi-mum Sum in Subarray, Lazy Propagation, How To Build A Segment Tree, Query On A Segment Tree, Segment Tree Max Pair Sum
	Fenwick Tree	Introduction to Fenwick Tree, Coordinate Compression, OrderSet Problem, Distinct Query

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TOPIC	SUB-TOPICS	DETAILS
GRAPHS	Graph Implementation	Return all connected components, Get Path - BFS, Get Path - DFS, Has path, Solution: BFS Traversal, DFS - Adjacency Matrix, Graphs Terminology, Graphs Introduction, Graphs Implementation, BFS Traversal, BFS & DFS for disconnected graph, Weighted & Directed Graphs
	Graph Algorithms	Dijkstra's Algorithm, Prim's Algorithm, Kruskal's Algorithm, Minimum Spanning Trees, Detect Cycle, Union Find Algorithm
	Advanced Graphs	Permutation Swaps, Connected Components, Fill Matrix Question, Connected Horses, Strongly Connected Components, Bipartite Graph

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TOPIC	SUB-TOPICS	DETAILS
STRINGS AND TRIES	String Algorithms	Longest Prefix Suffix, Z-Algorithm Pattern Matching, Longest Palindromic Substring Basics, KMP Algorithm, Pattern Matching Basics, Longest Prefix Suffix,
	Tries	Search Engine, SUBXOR, Maximum XOR Subarra, XOR Maximum Pair, Tries & XOR
MATHEMATICS FOR COMPETITIVE PROGRAMMING	Number Theory	GCD(Euclid Algorithm), Diophantine Equations, Multiplicative Modulo Inverse, Find Prime Numbers From 1 To N, Sieve Of Eratosthenes, Divisors Of Factorial, Advanced GCD, Euler's Totient Function, Segmented Sieve,Wilson's Theorem, Modular Exponentiation, Nth Fibonacci Number - Log(n), Fermat's Little Theorem, Matrix Exponentiation,Optimized Power Function, Recurrence Relations

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TOPIC	SUB-TOPICS	DETAILS
MATHEMATICS FOR COMPETITIVE PROGRAMMING	Game Theory	Othello, Othello Evaluation Function, MinMax Algorithm, Sprague Grundy Theorem, Grundy Numbers, Game Of Nim, Intro To Game Theory, Proof Of Nim Formula, Evaluation Function In MinMax Algorithm
	Computational Geometry	Convex Hull, Area Of A Polygon, Distance Of A Point, Intro To Computational Geometry, Intersection Of Two Lines

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TESTIMONIALS

RAGHUVANSH RAJ

"While I was experiencing the course, I constantly felt my confidence with respect to solving problems grow. I think that's what matters at the end of the day, the confidence that one can solve a problem and clarity in terms of approach. Coding Ninjas helped me inculcate both into my competitive programming journey because of which I was able to bag an internship at Visa."

KANIKA GOSWAMI

"This can be your go-to place for coding, all the faculty members are highly experienced. The course here helped me a lot in my placement process, grateful to the team!"

VINAYAK KUMAR

"Coding Ninjas helped me explore various opportunities when I was in doubt during my 4th semester. Ankush sir is the best mentor I've come across in my life, gradually I moved on to Web Development and Competitive Programming course which helped me sharpen my skills and achieve an offer at Amazon."