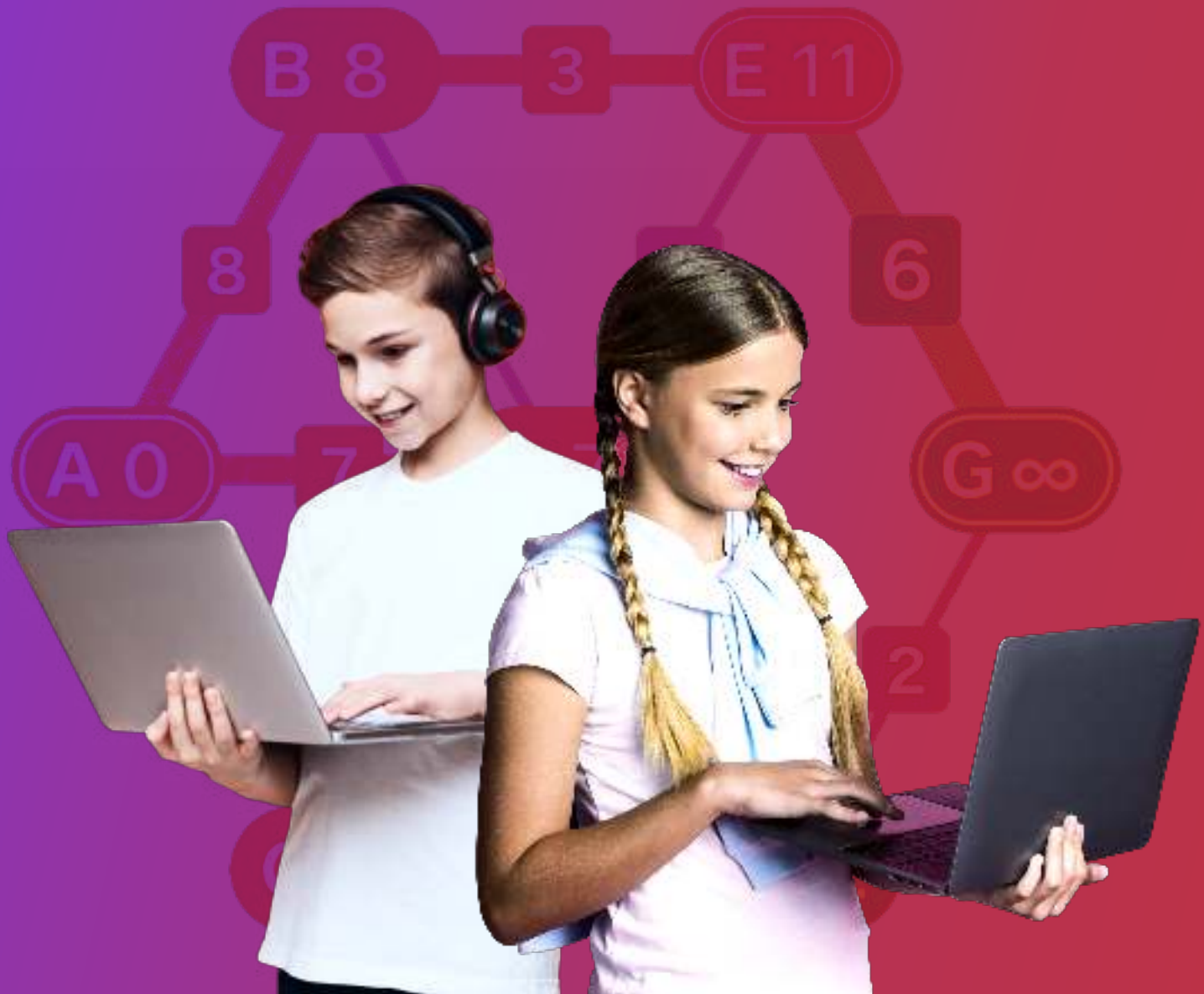
Codingal
Where kids love coding

IOI Algorithms Course

Learn | Build | Get Certified

Ace the International Olympiad in Informatics (IOI) by mastering data structures and algorithms with expert teachers

IOI Curriculum for Grades 6 - 12



IOI Algorithms Course | Grade 6 - 12

Learn the basics of data structures and algorithms (DSA), master algorithmic programming techniques, and apply your newly-learned skills to prepare for the IOI

82 Classes
150+ Projects
82 Quizzes

Key learnings

- Master Python from Basic to advanced features.
- Learn and Implement Data Structures.
- Learn and Implement effective Algorithms.
- Enhance Analytical and Problem-Solving skills.
- Hands-on coding and Problem Solving.

Exclusive Benefits

- Unlimited doubt sessions for students
- Dedicated coding instructor to help you learn all the coding concepts

Module 1 **Python Introduction**	Learn about the Python programming language including its history, applications, concepts like data types, conditionals, and loops, patterns using Turtle.
Lesson 1 **Introduction to Python**	Get introduced to Fundamentals of Programming and Python.
Lesson 2 **Operators and Data Types**	Get introduced to data types and operators in Python.
Lesson 3 **Conditional Statements and Date Time Module**	Learn about the Conditional Statements and Date Time module in Python.
Lesson 4 **Loops**	Get introduced to various loops in Python.
Lesson 5 **Functions**	Learn about Functions in Python.
Lesson 6 **Introduction to Turtle**	Get introduced to the Turtle Library of Python.

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Module 2 **Advanced Python**	Learn about data structures, classes, polymorphism, encapsulation and object-oriented programming and create various programs using these concepts.
Lesson 1 **Data Structures in Python - 1**	Get introduced to Python Data Structures - List and Dictionary.
Lesson 2 **Data Structures in Python - 2**	Learn about Python data structures - dictionaries and tuples and their functions.
Lesson 3 **Object-Oriented Programming - 1**	Know about Fundamentals of Object-Oriented Programming in Python.
Lesson 4 **Object-Oriented Programming - 2**	Get introduced to Fundamentals of Object-Oriented Programming in Python.
Lesson 5 **Inheritance and Abstraction**	Learn about Inheritance and Abstraction in Python.
Lesson 6 **Polymorphism and Encapsulation**	Get introduced to Polymorphism and Encapsulation in Python.

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Module 3
Array

Learn about Array in Python, operations on arrays and important algorithms.

- Lesson 1
  Introduction to Arrays
  Get introduced to Arrays, declare an array, access its elements, and perform operations.

- Lesson 2
  Array Problems 1
  Gain knowledge on how to approach some of the important array problems and algorithms.

- Lesson 3
  Array Problems 2
  Learn how to approach some of the important array problems and algorithms.

- Lesson 4
  Array Problems 3
  Deep dive into array problems and learn how to approach some of the important array problems and algorithms.

- Lesson 5
  Kadane Algorithm
  Learn about the Kadane algorithm, how we can use it to find the maximum array sum and its applications.

- Lesson 6
  Array problems 4
  Learn how to approach some of the important array problems and algorithms.

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Module 4
Searching and Sorting

Learn about Searching and Sorting algorithms, concepts + implementation using Python.

- Lesson 1
  Linear Search
  Learn how the Linear Search Algorithm works to search any item in the data structure.

- Lesson 2
  Binary Search
  Learn how the Binary Search Algorithm works to search any item in the data structure.

- Lesson 3
  Two Pointer Game
  Learn how the Two Pointer Approach is better than the Naive Approach.

- Lesson 4
  Bubble Sort
  Learn how the Bubble Sort Algorithm works to sort the items in the data structure.

- Lesson 5
  Selection Sort
  Learn how the Selection Sort Algorithm works to sort the items in the data structure.

- Lesson 6
  General Problems
  Learn to solve general problems using algorithms in the data structure.

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Module 5

Advanced Sorting Algorithms

Gain knowledge about Advanced Sorting algorithms, concepts + implementation using Python.

Lesson 1 **Insertion Sort**	Learn how Insertion Sort Algorithms work to sort the items in the data structure.
Lesson 2 **Shell Sort**	Know more about how Shell Sort Algorithm works to sort the items in the data structure.
Lesson 3 **Quick Sort**	Gain knowledge about Quick Sort Algorithm works to sort the items in the data structure
Lesson 4 **Merge Sort**	Learn to sort the items in the data structure with Merge Sort Algorithm.
Lesson 5 **Comparison between Sorting Algorithms**	Learn how the Sorting Algorithm differs from each other based on time and space complexity.
Lesson 6 **General Sorting Problems**	Learn how the Sorting Algorithm differs from each other based on time and space complexity.

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Module 6

Nodes and Linked List

In this module learn about nodes, the building-block data structure and Linked List using Python linked list.

Lesson 1 **Linked List I**	Learn the basics of Linked List and how it is more efficient than Array in terms of complexities. Also learn operations like insertion, deletion, and searching in the linked list.
Lesson 2 **Linked List II**	Get introduced to the basics of Linked List. Also learn in detail about operations like swapping the nodes of the linked list and reversing the linked list.
Lesson 3 **Doubly Linked List I**	Get familiar with Doubly Linked List and how it is more efficient than single-linked lists. Also learn operations like insertion, deletion, and searching in the doubly linked list.
Lesson 4 **Doubly Linked List II**	Get introduced to the basics of Doubly Linked List. Also learn in detail about operations like swapping the nodes of the linked list and searching the item in the doubly linked list.
Lesson 5 **Matrix I**	This lesson will teach the basics of Matrices. Here we'll also learn operations like adding and multiplying the two matrices.
Lesson 6 **Matrix II**	Get ready to learn about the basics of Matrices. Further in this lesson you will also learn about operations like transposing and the sum of columns of the matrix.

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Module 7 **Strings**	Palindrome, Anagram, Basic Problem Solving in strings, Rabin, Karp Algorithm, KMP Algorithm.
▸ Lesson 1 **String I**	Get introduced to the basics of strings in Python. Also get familiar with some basic operations on strings in Python.
▸ Lesson 2 **String II**	Learn the basics of strings in Python. Know more about operations on strings in Python and string methods.
▸ Lesson 3 **Playing with frequencies**	Get introduced to the basics of strings in Python. Also learn to count the frequency of each character in the string and related programs.
▸ Lesson 4 **ASCII Codes**	Learn about the ASCII codes. Here you'll also learn some programs solved through the ASCII codes.
▸ Lesson 5 **Algorithms**	Deep dive into the procedure and working of Rabin Karp and Knuth–Morris–Pratt algorithms.
▸ Lesson 6 **General Problems**	Get familiar with some general problems with strings in Python.

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Module 8 **Stack and Queue**	Stack Implementation with an array, Implementation with Linked, List, Balanced parenthesis, Double stack in an array, Queue, Implementation with an array, Implementation with Linked List, Implement stack using queue.
▸ Lesson 1 **Stack**	Learn about basic stack concepts and operations on the stack.
▸ Lesson 2 **Stack Implementation**	Learn how to Implement a stack along with the linked list.
▸ Lesson 3 **Double stack**	Get familiar with one of the approaches to storing the elements of two stacks in an array. Both stacks will be using the same array for storing their elements.
▸ Lesson 4 **Queue**	Get introduced to the basics of Queue concepts and operations on Queue.
▸ Lesson 5 **Queue with linked list**	Learn about basic Queue implementation with linked lists.
▸ Lesson 6 **Implementation of stack using Queue**	Learn about the implementation of a stack using a queue.

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Module 9 **Trees**	Tree Introduction, Implementation, Application, Binary Tree, Tree Traversal: Inorder, Preorder, Postorder traversal.
▸ Lesson 1 **Introduction to Binary Tree**	Learn about binary trees, how they work, their representation, advantages, and properties.
▸ Lesson 2 **Operations on Binary Tree**	Gain knowledge about various operations performed on binary trees.
▸ Lesson 3 **Auxiliary Property of Binary Tree**	Learn about the binary tree, how it works, its representation, advantages, and properties.
▸ Lesson 4 **Tree Traversals**	Learn about binary trees, how they work, their representation, advantages, and properties.
▸ Lesson 5 **Application on Binary Tree I**	Get familiar with various types of problems on Binary Trees.
▸ Lesson 6 **Application on Binary Tree II**	Learn about binary trees, how they work, their representation, advantages, and properties.

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Module 10
More on Trees

Making BST, Search in BST, Insert in BST, Deletion in BST, Making segment trees, Use in DBMS, B+, B trees.

Lesson 1 **Binary Search Tree**	Get introduced to the concept of the Binary search tree.
Lesson 2 **Operations on a Binary Search Tree**	Learn about operations on a Binary search tree.
Lesson 3 **Searching in Binary Search Tree**	Learn the implementation of a binary search tree
Lesson 4 **Deletion on a Binary Search Tree**	Get familiar with Deletion in a Binary Search Tree.
Lesson 5 **Making a Segment Tree and Uses in DBMS**	Learn about how to make a segment tree and what are all the uses in binary trees.
Lesson 6 **B Trees and B+ Trees**	Get hands on knowledge about implementation of Binary Trees and B+Trees.

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Module 11 **Heap and Hashing**	Introduction to Heap, Implementation, Heapify, Heapsort, Priority queue, Introduction to Heap, Hash function, Collision, handling, Questions regarding hashing.
▸ Lesson 1 **Heap**	Learn about the Heap Data Structure.
▸ Lesson 2 **Binary Heap Implementation**	In this lesson, students will learn about the implementation of the Binary Heap Data structure.
▸ Lesson 3 **Heapify**	Get familiar with Heapify and its implementation.
▸ Lesson 4 **Heap Sort**	Learn about Heap Sort, the best sorting technique
▸ Lesson 5 **Priority Queue**	Deep dive and learn about the priority queue.
▸ Lesson 6 **Hashing & Collision Handling Techniques**	Learn about the Hashing and Collision handling techniques.

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Module 12 **Graphs**	Graph using Adjacency matrix, Adjacency list, Breadth-first, search, Depth-first search and related problems.
▸ Lesson 1 **Graph**	Get familiar with Graph Data Structure.
▸ Lesson 2 **Graph using adjacency list**	Learn about the Graph Data Structure using an adjacency list.
▸ Lesson 3 **Breadth First Search (BFS)**	Gain knowledge about the Breadth First Search (BFS)
▸ Lesson 4 **Depth-first search (DFS)**	Learn about the Depth-first search (DFS)
▸ Lesson 5 **Iterative Depth First Traversal of Graph**	Get familiar with the Iterative Depth First Traversal of Graph
▸ Lesson 6 **Problems related to graphs**	Learn about the problems related to graphs

Hear what our students and parent have to say

Mohit Hulse

CodeWars Winner, Grade 11

I always enjoy Codingal competitions as the increasing difficulty levels as we progress make it so much more exciting.

Siddhant

HPE CodeWars Winner, Grade 10

Codingal gave me the once-in-a-lifetime experience of seeing my code run on the International Space Station.

Swastik

HPE CodeWars Winner, Grade 12

I won the HPE CodeWars competition and got the opportunity to run an experiment on the ISS thanks to Codingal.

Sushil Raaja U

Code Battle #1 Winner, Grade 11

As a student preparing for the IOI, Codingal has helped me greatly improve my problem solving and algorithmic thinking.

Aarav Eeshan

Code Battle Winner, Grade 11

The algorithmic problems in Codingal's competitions are super intriguing and I always get to learn something new.

Got questions? Contact us anytime.

Send us a message

support@codingal.com

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