

# Sigma Batch

Data Structures & Algorithms  
& Web Development



' Let not the fruit of action be your motive to action. Your concern is with action alone, not with the fruit of action. '

- *The Bhagavad Gita*

# DSA Overview

- ✓ Complete Java + Data Structures & Algorithms
- ✓ Live Doubt Assistance
- ✓ Student Community with TAs
- ✓ Live Resume Preparation & Mentorship sessions
- ✓ Library of Questions for Top Companies
- ✓ Coding Questions on all Important Topics (asked by Top Companies)



**Live** | **300+**  
+ VOD | solved questions  
practice

**Duration : 4 Months**  
Course access is for 2 Years

# Topics

## Java

CATEGORY	CHAPTERS	OVERVIEW
Basics of Programming	Flowcharts & Pseudocodes Variables & Data Types Conditional Statements Operators	what are flowcharts, pseudocodes, decision making using flowcharts, examples Our first Java program, Variables and data types, Taking input/output, How java code runs? Introduction to if else, else if, Nested conditionals, switch arithmetic, relational, logical & assignment operators
Loops & Functions	For loop, While loop, Do-while loop Patterns Functions	For loops, While loops, Do-while loops, Flow of execution of statements, break & continue, examples Introduction to nested loops, basic to advanced patterns solved (butterfly, floyd's triangle, rhombus etc.) Introduction to functions, function calling, Pass by value, scope
Arrays	Introduction to Arrays Searching & Sorting	Introduction to arrays, arrays in memory, Passing arrays to functions, interview problems Linear search, Binary search, Selection sort, Bubble sort, Insertion sort, count sort
2D Arrays & Strings	2D Arrays Strings	2D arrays, 2D arrays in memory, Examples using 2D Arrays Introduction to strings & StringBuilder, storage of strings and their inbuilt functions

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# Data Structures & Algorithms (DSA)

CATEGORY	CHAPTERS	OVERVIEW
Problem Solving Techniques	Recursion, Backtracking, Divide & Conquer  Bit Manipulation  Time & Space Complexity  Greedy Algorithms	Introduction to recursion, Principle of mathematical induction, factorial, Fibonacci numbers, Recursion using arrays, Recursion using strings, Recursion using 2D arrays, backtrack, merge sort, quick sort  Binary number system, bitwise operators, operations on bits, fast exponentiation  Order complexity analysis, Theoretical complexity analysis, Time complexity analysis of searching and recursive algorithms, Space complexity analysis of merge sort  Introduction to greedy approach to problem solving, solving classical problems
Object-oriented programming	Basic to Advanced OOP	Objects & Classes, Creating objects, Getters, and setters, Constructors and related concepts, Inbuilt constructor and destructor, Example classes, Static members, Function overloading and related concepts, Abstraction, Encapsulation, Inheritance, Polymorphism, Abstract classes, Interfaces
Linear Data Structures	ArrayLists  Linked lists  Stacks and Queues	Introduction to java collection framework, arrays, solved questions  Linked list Introduction, 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 Introduction, Stack using arrays, Dynamic Stack class, Stack using linked list, Inbuilt stack, Queue using arrays, Dynamic queue class, circular queue

# Data Structures & Algorithms (DSA)

CATEGORY	CHAPTERS	OVERVIEW
Advanced Data Structures	Binary Trees & BST	Introduction to Binary Trees, Constructing the tree, Binary Tree traversals, Diameter of binary tree, height & LCA of the tree, Introduction to Binary Search Trees, Searching a node in BST, BST class, Inserting and Deleting nodes in BST, Types of balanced BSTs
	Heaps/Priority Queues	Introduction to Heaps, Min/Max heaps, Heap Sort, Priority Queues, how to implement priority queues, Introduction to CBT(Complete Binary Trees) and its implementation, Insert and Delete operations in heaps, Implementing priority queues, In-built Priority Queue
	Hashing (Maps & Sets)	Introduction to Hashing, Hashmaps, Inbuilt Hashmap, Hashsets, In-built Hashsets, Hash functions, Insert and Delete operation implementation in hashmap/hashset, examples
	Tries	What are Tries, Creating a Trie node class, Insert, Search and Remove operation in Tries, Types of Tries, Questions on Tries
	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, Bellman Ford Algorithm & a lot of questions
	Segment Trees	What are segment trees, Creation of segment trees, solving range queries
Dynamic Programming	DP & its Questions	Fundamentals of Dynamic Programming, Introduction to Memoization, Knapsack using DP, Factorial using DP, Fibonacci numbers using recursion, memoization and tabulation, Longest Common Subsequence (LCS) using recursion, Catalan's number, Edit distance using recursion, memoization and dynamic programming, Matrix Chain Multiplication and much more

# Development Overview

- ✓ Complete Frontend Development
- ✓ Complete Backend Development
- ✓ Complete Database (SQL & MongoDB)
- ✓ Complete MERN Stack (MongoDB, Express, React, Node)
- ✓ Real Life and Industry Grade Projects
- ✓ LIVE sessions on how to get a job, resume, open source & more



**500+**  
video  
lectures

**12+**  
Hours of Live  
Sessions

**Duration :** 4.5 Months  
Course access is for 2 Years

CATEGORY	CHAPTERS	OVERVIEW
Introduction	What is Web? Client-Server Architecture Setting Developer Environment	Understanding how and who built the web General architecture used by websites; requires & response Setting our environment on our laptop/computer where we'll do coding
HTML	Structure Tags in HTML Block v/s Inline Tables Forms	How to create the structure of a web page Learning about various tags in HTML like <code>&lt;h1&gt;</code> , <code>&lt;p&gt;</code> , <code>&lt;a&gt;</code> , <code>&lt;img&gt;</code> etc Understand the difference between inline and block HTML elements Learn to create tables in HTML Learn about forms and form fields
Intro to CSS	Introduction	What is CSS & how to use it in HTML, different styles of writing
Selectors in CSS	Understanding Selectors Selector Specificity	Element, Class & Id selectors etc., combinator, pseudo classes, pseudo elements, specificity in CSS Understanding the specificity & priority of CSS selectors

CATEGORY	CHAPTERS	OVERVIEW
Styling with CSS	Box Model CSS Units	Understanding the CSS box model Learning about various CSS units used to style HTML elements, absolute & relative
More CSS	CSS Transition CSS Transforms	Understanding element transitions in CSS along with shorthand Understanding element transformations in CSS along with shorthand
Flexbox	Intro to Flex Flex properties	Understanding flexbox layout, cross axis, main axis etc. flexbox direction, justify content, align items, align self, flexwrap, flex sizing,etc.
Responsive Designs	Media Queries Animations & 3d Space	Learn about Media Queries & Viewport Basics of CSS animation and how to animate HTML elements using animate.css
Bootstrap	Frontend frameworks Components Layouts(Grid system)	What are frontend frameworks and how to use one Using various bootstrap elements like Navbar, buttons, cards etc Learning about grid system of bootstrap
Tailwind CSS	What is Tailwind?	Understanding Tailwind as a Framework

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CATEGORY	CHAPTERS	OVERVIEW
Tailwind CSS	Components	Covering button, navbar, fonts, margin, padding etc.
	Creating Responsive Designs	Understanding responsiveness in tailwind, @apply, @layer etc.
Major Project	CSS Major Project	Focus on using concepts we have learned to build our project
Starting with Javascript	Intro to JS	What is JS and use of JS
	Variables, operators, conditional, loops	Learning the basics of the language
Functions and Arrays in JS	Scope	Understanding scope in JS
	Hoisting	What is hoisting and its application
	Functions expressions v/s Function declaration	Difference between function expression and declaration
	Arrays and its usage	What are arrays and using array functions like splice, slice etc.
Objects and Timing Events	Intro to Objects	What are objects, how to create them and using different notations to access object's data
	Object functions	Learn to iterate over objects, delete object properties, creating nested objects
Understanding DOM	DOM	Understanding DOM, what it is, how to access elements from the DOM

CATEGORY	CHAPTERS	OVERVIEW
Understanding DOM	Events	How to manipulate DOM events in JS
Closures	IIFE Closures Arrow functions	What are immediately invoked function expressions What are closures and its application Learning about arrow functions and bindings in arrow functions
Constructors and Prototypes	“this” keyword Prototypes Class	How does the “this” keyword works in JS Discussing what are prototypes in JS, why do we use them and its application Learning about using classes in JS and how to deal with class inheritance in JS
Ashyncronous JavaScript	Promises, Callback Timed Events Async Await	What are promises and callbacks in Javascript, Why to use What is setTimeout, Event loops in javascript What are Async Await in Javascript, Why that is important
Ajax	Intro to AJAX	What are async requests, what is API and JSON

CATEGORY	CHAPTERS	OVERVIEW
Promises	Intro to promises	What is a promise, how do we use promises and chaining promises
Git	Intro to Git	What is git and why it's helpful
	Branches	Exploring branches in Git. How to create branches.
	Git workflow	Understanding push, commits, pull requests and using git for teams and individual
Terminal	Mastering Terminal	Directories, Commands, paths, operations on files etc.
Major Project	JS Major Project	Create something classic by using the concept learn in JS

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CATEGORY	CHAPTERS	OVERVIEW
Node.js	Intro to Node Setting up	Introduction to the course, hello world with nodejs Setting up tools and the project
Writing Our First Server	Intro to servers Setting up node server nodemon	What are servers and how one can use them Beginning the project by setting up the very first node server Introducing nodemon to monitor changes made to the server
Creating Express Apps	MVC Express Ejs Middleware	MVC architecture for our server What are frameworks, using express with node What are template engines, setting up and working with Ejs What is a middleware and how to use one
Intro to Databases	Database SQL	What are databases & why do we need them what is SQL, SQL queries etc.
MongoDb	MongoDB DB operations	What is MongoDB, how to use it and setting up MongoDB for the project CRUD operations for MongoDB

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## Backend

CATEGORY	CHAPTERS	OVERVIEW
MongoDb	Mongoose	Linking MongoDB using Mongoose
Mega Project	Working on our Mega Project	APIs, error handling, validation, express router, authentication, deployment & many more concepts to be covered

## React

CATEGORY	CHAPTERS	OVERVIEW
React	Components, Styling & more	What is React, installation, react components, styling in react, component lifecycle methods, Material UI etc.
Major Project	React Project	Using the concepts we have learnt to build our project

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Lectures will be uploaded on **Alternate Days**

Till then, keep learning & keep exploring ❤️

Start Date : 24th December, 2023