Data Structures & Algorithms with C++ (C++17)

A Complete Interview-Oriented Learning Roadmap

Instructor:	Mahmoud Salem
Start Date:	February 10, 2026
Duration:	7 Months (56 Sessions)
Schedule:	2 Sessions per Week
Target:	LeetCode Top 150 Problems
Price:	**$150 USD**

Consistency • Deep Understanding • Confidence

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Welcome Message

Welcome to the **Data Structures & Algorithms with C++** course.

This course is designed to help you move from knowing how to write code to understanding how to *think algorithmically*. You will learn how to analyze problems, break them down, and build correct and efficient solutions.

Note

This is not a crash course. It is a **structured, long-term journey** that rewards consistency and effort. Expect to dedicate 1-2 hours daily for practice outside of sessions.

What You Will Gain

By the end of this course, you will be able to:

- Solve **150+ carefully selected LeetCode problems**
- Identify common algorithmic patterns instantly
- Master **recursion, trees, graphs, and dynamic programming**
- Analyze **time and space complexity** confidently
- Approach technical interviews with **clarity and confidence**
- Write clean, optimized C++ code using modern STL

Teaching Methodology

Each topic is delivered using a proven pedagogical structure:

- **Concept Sessions** — Intuition, mental models, visuals, and core ideas
- **Problem-Solving Sessions** — Live solving of interview-level problems
- **Hybrid Sessions** — Explanation combined with guided practice
- **Review Sessions** — Monthly consolidation and Q&A

Pro Tip

Special emphasis is placed on **recursion**, as it forms the foundation for trees, backtracking, and dynamic programming. Master recursion, and the rest becomes significantly easier.

Student Commitment

To benefit fully from this course, students are expected to:

- Attend sessions regularly (2 sessions per week)
- Review session material after each class
- Attempt problems **independently** before viewing solutions
- Accept struggle as part of the learning process

Important

Progress comes from consistency, not speed. Students who practice daily, even for short periods, outperform those who cram before sessions.

Curriculum Overview

Month	Topic	Key Concepts
1	Arrays & Strings	Big-O, Two Pointers, Sliding Window, STL
2	Linked Lists, Stacks & Queues	Fast/Slow Pointers, Monotonic Stack
3	Recursion & Backtracking	Call Stack, Base Cases, Pruning
4	Trees & BST	DFS, BFS, Tree Properties, BST Operations
5	Heaps, Hashing & Sorting	Priority Queues, Hash Tables, Custom Sort
6	Binary Search & Graphs	Topological Sort, Union-Find, BFS/DFS
7	Dynamic Programming	Memoization, Tabulation, Classic DP Patterns

Detailed Session Schedule

Month 1: Foundations, Arrays & Strings

S	Type	Topic	LeetCode
1	Concept	Course Overview + C++ Review	—
2	Concept	Time & Space Complexity, STL	—
3	Concept	Array Problem Patterns	—
4	Solve	Two Pointers	1, 26, 27, 88
5	Concept	Sliding Window Technique	—
6	Solve	Sliding Window Problems	121, 209, 3
7	Concept	Strings & Character Handling	—
8	Solve	String Problems	125, 242, 49

Month 2: Linked Lists, Stack & Queue

S	Type	Topic	LeetCode
9	Concept	Singly Linked Lists	—
10	Solve	Linked List Problems	206, 21, 141
11	Concept	Fast & Slow Pointer Technique	—
12	Solve	Cycle / Middle Problems	142, 876, 234
13	Concept	Stack Fundamentals	—
14	Solve	Stack Applications	20, 155, 496
15	Concept	Queue & Deque	—
16	Solve	Queue Problems	232, 933

Month 3: Recursion & Backtracking

Note

This month is **intentionally extended** with extra practice to ensure deep understanding. Recursion is the foundation for everything that follows.

S	Type	Topic	LeetCode
17	Concept	Introduction to Recursion	—
18	Concept	Call Stack and Base Cases	—
19	Hybrid	Recursion on Arrays	509, 70
20	Solve	Recursion Practice	344, 206
21	Concept	Backtracking Fundamentals	—
22	Solve	Backtracking Problems	46, 78
23	Hybrid	Recursion Tree Analysis	22
24	Review	Full Recursion Review	Mixed

Month 4: Trees & Binary Search Trees

S	Type	Topic	LeetCode
25	Concept	Binary Tree Fundamentals	—
26	Solve	DFS Traversals	94, 144, 145
27	Concept	BFS / Level Order Traversal	—
28	Solve	BFS Problems	102, 199
29	Concept	Tree Properties	—
30	Solve	Height / Diameter	104, 543
31	Concept	Binary Search Trees	—
32	Solve	BST Problems	98, 230

Month 5: Heap, Hashing & Sorting

S	Type	Topic	LeetCode
33	Concept	Heap and Priority Queue	—
34	Solve	Heap Problems	215, 347
35	Concept	Hash Tables	—
36	Solve	Hashing Problems	1, 217, 451
37	Concept	Sorting Algorithms	—
38	Solve	Sorting Problems	912, 56
39	Hybrid	Custom Sorting	179
40	Review	Monthly Review	Mixed

Month 6: Binary Search & Graphs

S	Type	Topic	LeetCode
41	Concept	Binary Search Fundamentals	—
42	Solve	Binary Search Problems	704, 33
43	Concept	Graph Representation	—
44	Solve	DFS / BFS on Graphs	200, 133
45	Concept	Topological Sorting	—
46	Solve	Topological Problems	207, 210
47	Hybrid	Grid Graph Problems	695
48	Review	Graph Review	Mixed

Month 7: Dynamic Programming & Final Review

Pro Tip

DP is the culmination of everything learned. If you mastered recursion in Month 3, DP will feel like a natural extension.

S	Type	Topic	LeetCode
49	Concept	DP Introduction	—
50	Solve	1D Dynamic Programming	70, 198
51	Concept	Knapsack Pattern	—
52	Solve	Knapsack Problems	416
53	Concept	LIS and LCS	—
54	Solve	LIS / LCS Problems	300, 1143
55	Solve	Advanced DP Problems	62, 377
56	Final	**Full Course Revision**	Top 150

Frequently Asked Questions

Do I need strong C++ knowledge before joining?
Basic familiarity with C++ is enough. The course includes a focused C++ review in the first week.

Is this course suitable for beginners?
Yes, if you are committed. The difficulty increases gradually with continuous support.

Will we solve all LeetCode Top 150 problems?
Yes. The curriculum systematically covers the entire list plus additional practice problems.

What if I miss a session?
Recordings are available for 48 hours after each live session.

Enrollment Information

Course Fee:	**$150 USD** (one-time payment)
Start Date:	February 10, 2026
Duration:	7 Months (56 Sessions)
Class Size:	Maximum 30 Students
Recordings:	Available for 48 hours
Certificate:	Issued upon completion

Contact Information

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About the Instructor

Mahmoud Salem is a Software & Data Engineer with 4+ years of experience delivering enterprise-grade solutions across MENA and international markets.

- .NET Core, ASP.NET, Microservices Architecture
- Azure Data Factory, Synapse Analytics, Cloud Platforms
- 500+ LeetCode problems solved
- ITI Graduate (Web Development & BI)
- Experience with government digital transformation projects

*"This course is designed for students who want **real improvement**, not shortcuts.*

*If you stay **consistent** and **trust the process**,*
*your problem-solving skills will improve **dramatically**."*

— Mahmoud Salem