Data Structures and Algorithms 2
Course Syllabus (2024-2025)

Start of Semester 24/9/2024

Course Schedule

Week 1	**Chap. 1 - Programming: A General Overview** **Lecture 1**	1.1 Introduction 1.2 Mathematics Review 1.3 A Brief Introduction to Recursion
Week 2	**Chap. 2 - Algorithm Analysis** **Lecture 1**	2.1 Mathematical Background 2.2 Model 2.3 What to Analyze
Week 3	**Chap. 2 - Algorithm Analysis** **Lecture 2**	2.4 Running-Time Calculations
Week 4	**Chap. 3 - Lists, Stacks, and Queues** **Lecture 1**	3.1 Abstract Data Types (ADTs) 3.2 The List ADT 3.3 **vector** and **list** in the STL 3.4 Implementation of **vector**
Week 5	**Chap. 3 - Lists, Stacks, and Queues** **Lecture 2**	3.5 Implementation of **list** 3.6 The Stack ADT 3.7 The Queue ADT
Week 6	**Chap. 4 - Trees** **Lecture 1**	4.1 Preliminaries 4.2 Binary Trees 4.3 The Search Tree ADT—Binary Search Trees **Quiz #1**

Week 7	**Chap. 4 - Trees** **Lecture 2**	4.4 AVL Trees 4.5 Splay Trees *(self study)* 4.6 Tree Traversals (Revisited) 4.7 B-Trees 4.8 Sets and Maps in the Standard Library
Week 8	**Chap. 5 - Hashing** **Lecture 1**	5.1 General Idea 5.2 Hash Function 5.3 Separate Chaining 5.4 Hash Tables without Linked Lists 5.5 Rehashing 5.6 Hash Tables with Worst-Case O(1) Access 5.7 Universal Hashing 5.8 Extendible Hashing
Week 9	**Chap. 5 - Hashing** **Lecture 2**	5.6 Hash Tables with Worst-Case O(1) Access 5.7 Universal Hashing 5.8 Extendible Hashing
Week 10	**Chap. 6 - Priority Queues (Heaps)** **Lecture 1**	6.1 Model 6.2 Simple Implementation 6.3 Binary Heap 6.4 Applications of Priority Queues 6.5 d-Heaps
Week 11	**Chap. 6 - Priority Queues (Heaps)** **Lecture 2**	6.6 Leftist Heaps 6.7 Skew Heaps 6.8 Binomial Queues 6.9 Priority Queues in the Standard Library *(self study)* **Quiz #2**
Week 12	**Chap. 7 - Sorting** **Lecture 1**	7.1 Preliminaries 7.2 Insertion Sort 7.3 A Lower Bound for Simple Sorting Algorithms 7.4 Shellsort
Week 13	**Chap. 7 - Sorting** **Lecture 2**	7.8 A General Lower Bound for Sorting 7.9 Decision-Tree Lower Bounds for Selection Problems 7.10 Adversary Lower Bounds 7.11 Linear-Time Sorts: Bucket Sort and Radix Sort 7.12 External Sorting

Week 14	**Chap. 8 - Graph Algorithms (Brief Intro.) Lecture 1**	8.1 Definitions 8.2 Topological Sort 8.3 Shortest-Path Algorithms 8.4 Network Flow Problems 8.5 Minimum Spanning Tree 8.6 Applications of Depth-First Search

Required Materials:

- Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 4th edition, Pearson, 2014

Assessment and Grading:

- Final Examination: [50%]

- Midterm Examination: [20%] week#8

- Quiz #1 [7,5 %] week#6,
- Quiz #2 [7,5 %] week#11

- 2 Homework Assignment [10%]

- Lab & Tutorial attendance and Participation: [5%]

Note: This syllabus is subject to change. Any modifications will be communicated in advance.