**National University of Computer & Emerging Sciences, Karachi** **CS-218 Data Structures - (Spring 2021)  
Course Outline**

**Course Learning Outcomes (CLOs):**

1. Student will be able to learn and understand basic/advanced data structures
2. Student will be able to perform analysis of data structures choices for any real-world application.
3. Student will learn the tradeoff with different choices of data structures
4. Student will be able to write computer solutions for efficiently store, retrieve manipulate and update the data stored inside computers.

**Course Outline:**

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| **Week wise distribution** | **Topics Covered** |
| **Week 1** | ADT, C++ Language Specification, Pointers revisited, Rule of Three |
| **Week 2** | Recursion, it's types, issues and Backtracking (with examples) |
| **Week 3** | List (Singly Linked List), List (Doubly Linked List), List (Circular Linked List) |
| **Week 4** | List (Singly Linked List), List (Doubly Linked List), List (Circular Linked List) |
| **Week 5** | Elementary Sorting Techniques |
| **Week 6** | Mid-term I |
| **Week 7** | Advanced Searching Techniques and their issues, Binary Search |
| **Week 8** | Stack, Queue, their implementation strategies and applications |
| **Week 9** | Priority Queues, Heaps as Priority Queues |
| **Week 10** | Binary trees and their properties (Full Binary Tree, Complete Binary Tree), Multi-way Trees/Tries |
| **Week 11** | Binary Search Trees, their operations and applications, skewness and issues |
| **Week 12** | Mid-term II |
| **Week 13** | Balance in Binary Search Trees, AVL Trees |
| **Week 14** | Hashing, Hash Functions, Collision-resolution Techniques, Rehashing |
| **Week 15** | Graphs and their representation and traversal, Shortest Path Problem, Minimum Spanning Trees, Graph Algorithms, Topological Sort |
| **Week 16** | Revision |

**Course Coordinator:**Dr. Muhammad Rafi

**Course Instructors:**  
Anam Qureshi  
Syed Zain Ul Hassan  
Basit Ali  
Farah Sadia

**Textbook:**  
Data Structures and Algorithms in C++ 4th Edition by Adam Drozdek

**Reference books:**  
Data Structures & Algorithms Made Easy 5th Edition by Narasimha Karumanchi  
Data Structures with C by Schaum's series

**Marks Distribution:**

Mid-1: 15

Mid-2: 15

Project: 10

Assignments: 10

Final: 50