**CSIT-21201: Data Structure and Algorithms**

**Instructor:** Alia Sharif

**Contact:**alia.shreef453@gmail.com

**Course Objectives**: A study of advanced programming topics focused on logical structures of data, their physical representation, design and analysis of algorithms operating on the structures, and techniques for program development and debugging. Emphasis is placed on the appropriate use and choice of standard data structures.

**Pre-Requisites**: Programming Fundamentals

**Text Books:**

1. Data Structures and Algorithm Analysis by Mark Allen Weiss, Florida International University, Addison-Wesley (latest Edition)

**Reference Books:**

1. Algorithms, Robert Sedgewick, Princeton University Publisher: Addison-Wesley Professional (latest Edition)

2. Data Structures and Algorithms in C++, Adam Drozdek, Course Technology; 4th Edition, 2012.

**Course Outline:** Mid Term

|  |  |
| --- | --- |
| **Week** | **Course contents** |
| Week1 | Introduction to algorithms: pseudo code, Pointers and arrays, Structures, etc. |
|  |  |
| Week 2 | Prefix, Infix, Postfix equations, Abstract Data Types, Linear Data structures: Stack, Queue, etc. |
|  |  |
| Week 3 | Stacks: Top of stack, Push() and Pop(), Top(), Empty() operations, Implementing stack with arrays, Implementing stacks with pointers |
|  |  |
| Week 4 | Queues: Back, Front of queue, Enqueue(), Dequeue(), Peek(), Empty() operations, Implementing queue with arrays, Implementing queue with pointers |
|  |  |
| Week 5 | Types of Queues: Circular queue, Priority Queue |
|  |  |
| Week 6 | MID TERM |

**Course Outline:** Final Term

|  |  |
| --- | --- |
| **Week** | **Course contents** |
| Week7 | Link-Lists: Single Link List, Insertion, Deletion, Searching in link list, Implement single Link List with pointers |
|  |  |
| Week 8 | Double Link List, Insertion, Deletion, Searching in double link list, Implement double Link List with pointers |
|  |  |
| Week 9 | Non-linear Data Structures: Binary trees, Tree height. Tree Traversal (In-Order, Pre-Order, Post-order) |
|  |  |
| Week 10 | Implement binary tree using double Link List, Binary search trees |
|  |  |
| Week 11 | Non-linear Data Structures: Graph, Directed graph, weighted graph, Adjacent nodes, Graph traversal Heaps, Path algorithms: depth-first and breadth-first searches |
|  |  |
| Week 12 | Hashing: Hash function, hash key, Collision, Collision Resolution, Collision Resolution Techniques: Linear Probing, Quadratic probing, Chaining |
|  |  |
| Week 13 | Searching: Linear search and Binary search Finding minimum and maximum |
|  |  |
| Week 14 | Sorting: Linear sort, Insertion sort, Merge sort |
|  |  |
| Week 15 | Sorting: Selection sort, Quick sort |
|  |  |
| Week 16 | FINAL TERM |