



**INSTITUTE OF BUSINESS & MANAGEMENT SCIENCES
KHYBER PAKHTUNKHWA
AGRICULTURAL UNIVERSITY PESHAWAR**
Phone: 9216537 Exchange: 9216572-9 Ext: 3134 Fax:9216520

Program: BS (IT)-3rd
Course Title: Data Structure & Algorithms
Course Code: IT-401
Session: 2022 - 2026
Course Hours: 04 (03 + 01)
Total Week: 16
Total Credit Hours: 48

Course Objectives

Welcome to the course of data structure. Data structure is very important subject as the topics covered in it will be encountered by you again and again in the future courses. By completing this course you will be able to understand the basics of Data Structures. You will also know the elementary Data Structures. At the end of this course you will be able to implements these data structure techniques using any programming language like C++, JAVA etc.

Week -1

- Introduction to Data
- Field , Data item, Records
- Data Vs Information
- Definition of Data Structure
- Linear Data Structure
- Non Linear Data Structure
- Logical & Physical Data Structure

Week-2

- Introduction to Algorithms.
- Algorithmic Notations
- Control Structure of Algorithms
 - Sequential Flow
 - Conditional Flow
 - Iterative/Repetitive Flow
- Introduction to the Basic Operations of Data Structure
 - Insertion
 - Deletion
 - Traversing
 - Searching
 - Sorting
 - Merging

Week-3

- Introduction to Array
- Types of Array
 - One Dimensional Array
 - Two Dimensional Array
- Algorithm for traversing one Dimensional Array
- Algorithms for insertion & deletion in one Dimensional Array
- Accessing One Dimensional array by Dope Vector method
- Representation of One Dimensional array in computer memory

Week-4

- Introduction to Two Dimensional Array
- Accessing two Dimensional array by Dope Vector method
- Representation of Two Dimensional array in computer memory
 - Row-by row method
 - Column-by-column method

Week-5

- Introduction to Searching
- Types of Searching
 - Linear Search
 - Binary Search
- Algorithm for Linear Search
- Algorithm for Binary Search

Week-6

- Introduction to Recursion
- Program for Factorial using recursion function in C++
- Program for Fibonacci sequence using recursion function in C++
- Introduction to Tail, Non Tail, and Indirect Recursions

Week-7

- Introduction to Sorting
- Bubble Sort
- Selection Sort
- Insertion Sort
- Quick Sort
- Algorithms for Bubble Sort, Selection Sort, Insertion Sort & Quick Sort

Week-8

- Introduction to Stack
- Stack Implementation as Array and Linked List
- Operations on Stack
 - PUSH Operation
 - POP Operation
 - Algorithms for PUSH and POP

Week-9

- Introduction to Queue
- Queue Implementations as Array and Linked List
- Circular Queue
- Non-Circular Queue
- Operations on Queue
 - Insertion/Rear Algorithm for Circular and Non-Circular Queue
 - Deletion/Front Algorithm for Circular and Non-Circular Queue
- Introduction to Priority Queue
- Types of Priority Queue
- Representation of Priority Queue as One-Way Linked List

Week-10

- Introduction to One Way Linked List
- Operations on One Way Linked List
 - Insertion Operations
 - Front Insertion
 - Middle Insertion
 - End Insertion
 - Algorithms for Front Insertion, Middle Insertion and End Insertion
 - Deletion Operations
 - Front Deletion
 - Middle Deletion
 - End Deletion
 - Algorithms for Front Deletion, Middle Deletion and End Deletion

Week-11

- Introduction to Two Way Linked List
- Operations on Two Way Linked List
 - Insertion Operations
 - Front Insertion
 - Middle Insertion
 - End Insertion
 - Algorithms for Front Insertion, Middle Insertion and End Insertion
 - Deletion Operations
 - Front Deletion
 - Middle Deletion
 - End Deletion
 - Algorithms for Front Deletion, Middle Deletion and End Deletion

Week-12

- Introduction to Tree
- Terminologies used in Tree
- Introduction to General Tree
- Similar and Copies Trees

Week-13

- Binary Tree
- Types of Binary Tree
 - Strictly Binary tree
 - Full Binary Tree
 - Complete Binary Tree
 - Extended Binary Tree
- Binary Search Tree
- Operations on Binary Search Tree
 - Making of Binary Search Tree
 - Insertion in Binary Search Tree
 - Deletion from Binary Search Tree

Week-14

- Traversing of General Tree
 - Level by Level
 - Pre Order
 - Post Order
- Traversing of Binary Search Tree
 - Pre Order
 - In Order
 - Post Order
- Notations and Expressions and it's inter conversion

Week-15

- Introduction to Graph
- Graph Terminologies
- Graph Types
- Link representation of Graph

Week-16

➤ Revision

Total Marks: 100

Text Book:

1. Data Structure By Seymour Lipschutz, Schaum's Outline Series

Recommended Book:

2. Data Structure and Algorithms by Alfred V. Aho, John E. Hofcroft, Jeffery D. Ullman
3. Data Structures and Algorithms in C++ by Adam Drozdek
4. Data Structures and Algorithm Analysis in Java by Mark A. Weiss
5. Data Structures and Abstractions with Java by Frank M. Carrano & Timothy M. Henry
6. Data Structures and Algorithm Analysis in C++ by Mark Allen Weiss
7. Java Software Structures: Designing and Using Data Structures by John Lewis and Joseph Chase