## Data Structures using 'C'

| Semester – III | Subject Code: BS31601 | Lectures: 60 |
|---|---|---|

**Objectives:**

The syllabus aims in equipping students,

- To learn the systematic way of solving problem
- To understand the different methods of organizing large amount of data
- To efficiently implement the different data structures
- To efficiently implement solutions for specific problems

| Unit 1: Data structure concepts | 12 |
|---|---|

**1. Introduction to data structures**

- Concept
- Data Type
- Data Object, data structures
- Abstract data type (ADT )
  - Definition
  - Operation
  - Examples on rational number
- Need of Data Structure
- Types of Data Structure

[ **Ref. book 1**- Chapter 3]
[ **Ref. book 2**- Chapter 1]

**2. Algorithm analysis**

- Space complexity, time complexity (definition, simple example)
- Asymptotic notation (Big O, Omega Ω, Theta θ)- Examples on each notation

[ **Ref. book 2**- Chapter 1]

**3. Searching and Sorting Techniques**

- Searching techniques ( Linear Search, Binary search with efficiency)
- Sorting algorithms , characteristics with efficiency ( Bubble sort, Insertion sort, Merge sort, Quick Sort and their comparison )

[ **Ref. book 1**- Chapter 10]
[ **Ref. book 2**- Chapter 7]
[ **Ref. book 3**- Chapter 6,7]

St. Mira's College For Girls ★ Poona-411001 ★

| **Unit 2: Linear Data Structures** | **17** |
|---|---|

**4. Linked List**

- Introduction to Linked List
- Implementation of Linked List
  - Static representation (concept only )
  - Dynamic representation
- Types of Linked List
  - Singly
  - Doubly
  - Circular
- Operations on Linked List
  ( create, display, insert, delete, reverse, and search )
- Application of Linked List ( polynomial addition (using one variable) )

[ **Ref. book 1**- Chapter 5]
[ **Ref. book 2**- Chapter 4]
[ **Ref. book 3**- Chapter 4]

**5. Stack**

- Introduction
- Representation
  - Static
  - Dynamic
- Operations (push, pop, isempty and isfull )
- Infix, prefix(polish notation) and postfix(reverse polish notation) expressions
- Applications
  - infix to postfix conversion
  - postfix evaluation

[ **Ref. book 1**- Chapter 6]
[ **Ref. book 2**- Chapter 3]

**6. Queue**

- Introduction
- Representation
  - Static
  - Dynamic
- Operations (add, remove, isempty and isfull )
- Types of queue
  - Circular queue (static implementation)
  - Priority queue (with implementation)

  Doubly ended queue(concept only )

[ **Ref. book 1**- Chapter 7]
[ **Ref. book 2**- Chapter 3,9]

St. Mira's College For Girls Poona-411001

| Unit 3: Non linear Data structures | 19 |
|---|---|

**7. Trees**

- Concept and Terminologies
- Binary tree, binary search tree(BST)
- BST representation
  - Static
  - Dynamic
- Operations on BST ( create,insert, traversals (preorder, inorder, postorder), counting leaf, non-leaf and total nodes )
- Application - Heap sort (example only)
- Height balanced tree
  - AVL trees(definition, rotations and examples)

[ **Ref. book 1**- Chapter 8]
[ **Ref. book 2**- Chapter 5]

**8. Graph**

- Graph Representation ( Adjacency matrix, adjacency list, inverse adjacency list, adjacency multilist )
- Traversals ( BFS and DFS )
- Applications
  - AOV network – topological sort (example only)
  - AOE network – critical Path (example only)

[ **Ref. book 1**- Chapter 9]
[**Ref. book 2**- Chapter 6]

***Contact hours – 12 hours**

**Recommended Books:**


1. E. Balagurusamy, ***Data Structures using C***,Tata Macgraw - Hill Education
2. Horowitz, Sahani and Anderson-Freed, ***Fundamentals of Data Structures in C*** , 2nd Edition, Universities Press
3. Yedidyah Langsam, Aaron M. Tenenbaum, Moshe J. Augenstein , ***Data Structures using C*** ,Second Indian print, Pearson Education
4. Ashok Kamthane, ***Introduction to Data Structures using C*** , Pearson Education


St. Mira's College For Girls ★ Poona-411001 ★