

PARUL UNIVERSITY - Faculty of IT & Computer Science

Department of Computer Application

SYLLABUS FOR 2nd Sem B.Sc. (IT), BCA, IMCA, IMCA (A.Y.-IV) PROGRAMME

Data Structures (05101152)

Type of Course: B.Sc. (IT), BCA, IMCA, IMCA (A.Y.-IV)

Prerequisite: Knowledge of programming C

Rationale: This subject is to give knowledge of different operations to be performed on various types of data structures to the students.

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Scheme					Total
Lect Hrs/ Week	Tut Hrs/ Week	Lab Hrs/ Week		External		Internal			
				T	P	T	CE	P	
3	0	2	4	60	30	20	20	20	150

Lect - Lecture, **Tut** - Tutorial, **Lab** - Lab, **T** - Theory, **P** - Practical, **CE** - CE, **T** - Theory, **P** - Practical

Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	Introduction to Data Structures: Data, Data Organization, Data Access methods • Basics of Algorithm, , Asymptotic Notations, Complexity of Algorithms, Greedy algorithm, Divide and Conquer , Dynamic Programming , Introduction to data structures, their usage, Data structure bifurcation , General Application	11%	5
2	Linear Data Structures: Introduction, Types of Linear DS , Limitations and Advantages of Linear Data structure Array : Characteristics, Limitations , Features, Different Applications, Sparse Matrix Linked list : Characteristics, Limitations , Features, Different Applications, Different types of linked list and its operations (Singly , Doubly , Circular) Stack : Characteristics, Limitations , Features, Different Applications , Operations with algorithms, Expression Parsing with stack application , Recursion with examples & algorithms Queue : Characteristics, Limitations , Features, Different Applications , Operations, Characteristics of different types of queue and its operations with algorithms.	32%	18

3	Non Linear Data Structures: Introduction, Types of Linear DS , Limitations and Advantages of Non Linear Data structure Tree: Characteristics, Limitations , Features, Different Applications , Representation of tree, Traversal(inorder, preorder,postorder with algorithms), Characteristics of different types of tree (Binary tree and its sub types, AVL tree, Spanning tree , Heap tree excluding algorithms) Graph: Characteristics, Limitations , Features, Different Applications, Traversal (BFS , DFS), Types of graph (brief)	29%	13
4	Sorting, Searching and File Structure:: Sorting Algorithms: Selection, Bubble, Insertion, Shell, Quick sort , Merge sort Searching Algorithms: Sequential and Binary Search File: Operations on files, Types of files • File Organizations: Sequential files, Indexed Sequential file(ISAM), • Directed files and multi-key files • File performance criteria and terms Hash Table : Overview & Operations	28%	12

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

Reference Books:

1. An Introduction to Data Structures with Applications
Jean-Paul Tremblay, Paul G. Sorenson; Tata McGraw-Hill; 2nd Edition, (2007)
2. Let Us C
Yashavant P. Kanetkar; Tata McGraw Hill
3. Data Structures with C,
Seymour Lipschutz, Schaum's Outline,; Tata Macgraw Hill

Course Outcome:

After Learning the course the students shall be able to:

1. Describe the significance of various linear and non-linear data structure such as arrays, stack, queue, linked list, trees and graph
2. Identify the appropriate data structure for a given problem.
3. Construct most suitable data structure to solve a problem by considering various problem characteristic such as data size and various type of operation.
4. Design and implement various techniques for searching, sorting and hashing.

List of Practical:

1. **Write a C program to perform following operations on strings. (Use library functions for all operations) a) Find length of given string b) Copy string c) Compare given strings d) Concatenate given strings**
2. **perform following programs using array. a) Search element in array. b) Sort given array. c) Reverse elements of array. d) Addition of elements of array. e) Find largest element from given array. f) Find smallest element from given array.**
3. **Write a program to perform the following operations on a stack. Implement the stack using array). a) PUSH b) POP c) PEEP d) CHANGE**

4. Write a program to convert an infix arithmetic expression into postfix notation.
5. Write a program to evaluate a postfix expression.
6. Write a program to perform the following operation on a simple queue. (Implement the queue using array)
7. Write a program to perform the following operation on a circular queue. (Implement the queue using array) a) Insert an element b) Remove an element
8. Write a program perform the following operations on a singly linked list. a) Create Linked list b) Insert element at first position c) Insert element at last position d) Insert element in Linked list in sorted order e) Delete element from Linked list f) Copy Linked list g) Find the sum of elements of linked list e) Count number of nodes of linked list f) Search given element in linked list
9. Write program to sort a given list using Selection sort.
10. Write program to sort a given list using Bubble sort.
11. Write program to sort a given list using Quick sort.
12. Write program to sort a given list using Insertion sort.
13. Write program to sort a given list using Shell sort.
14. Write program to search an element in a given list using Linear Search.
15. Write program to search an element in a given list using Binary Search.