PARUL UNIVERSITY - Faculty of Engineering and Technology

Department of Computer Science & Engineering
SYLLABUS FOR 3rd Sem BTech PROGRAMME
Design of Data Structures (303105201)

Type of Course: BTech

Prerequisite: Computer Programming and Basic Syntaxes.

Rationale: Data structure is a subject of primary importance in Information and Communication Technology. Organizing or structuring data is important for implementation of efficient algorithms and program development. Efficient problem solving needs the application of appropriate data structure during program development. Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Scheme					Total
				External		Internal			
Lect Hrs/	Tut Hrs/	Lab Hrs/		T	P	T	CE	P	
3	0	0	3	60	-	20	20	-	100

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

Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	**Introduction**: Data Structures, Classifications (Primitive & Non-Primitive), Data structure Operations, Review of Arrays, Structures, Self-Referential Structures, and Unions. Pointers and Dynamic Memory Allocation Functions. Representation of Linear Arrays in Memory, dynamically allocated arrays. Performance analysis of an algorithm and space and time complexities	10%	6
2	**Stacks:** Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications: Polish notation, Infix to postfix conversion, evaluation of postfix expression. **Recursion -**Factorial, GCD, Fibonacci Sequence, Tower of Hanoi, **Queues:** Definition, Array Representation, Queue Operations, Circular Queues, Circular queues using Dynamic arrays, Deque, Priority Queues and its problems	15%	8
3	**Linked Lists:** Definition, Representation of linked lists in Memory, Memory allocation; Garbage Collection. Linked list operations: Traversing, Searching, Insertion, and Deletion. Doubly Linked lists, Circular linked lists, and header linked lists. Linked Stacks and Queues. Applications of Linked lists	10%	5

4	**Searching and Sorting** Interpolation Search **Sorts:** Selection Sort Insertion Sort Bubble Sort Quick Sort Merge Sort Radix Sort Bucket Sort	10%	5
5	**Trees:** Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals - In Order, Post Order, Pre Order; Additional Binary tree operations. Threaded binary trees, Binary Search Trees – Definition, Insertion, Deletion, Traversal, Searching, Application of Trees-Evaluation of Expression	10%	4
6	Red Black Trees and AVL Trees Introduction Operations on Red Black Trees AVL tree Construction Operations on AVL Trees	15%	8
7	**Hashing:** Hash Table organizations, Hashing Functions, Static and Dynamic Hashing.	10%	5
8	**Graphs:** Definitions, Terminologies, Matrix and Adjacency List Representation of Graphs, Elementary Graph operations, Traversal methods: Breadth First Search and Depth First Search. .	15%	9

*Continuous Evaluation:

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

Reference Books:

1. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, 2014.

2. Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014.

Course Outcome:

After Learning the course the students shall be able to:
different types of data structures, operations and algorithms

• Apply searching and sorting operations on files

• Use stack, Queue, Lists, Trees and Graphs in problem solving

• Implement all data structures in a high-level language for problem solving.