**ICT 2121                                            DATA STRUCTURES                          [3 1 0 4]**

**Course Objectives**

* Explain fundamentals of data structures and their applications essential for programming/problem solving
* Analyze Linear Data Structures: Stack, Queues and Linked Lists
* Analyze Non-Linear Data Structures: Trees and Graphs

**Abstract**

Introduction, Stacks, Queues and their applications, Sparse Matrix, Pointers and dynamic memory allocation, Linked Lists: Singly linked lists, Dynamically Linked Stacks and Queues, Polynomial representation and polynomial operations using singly linked list, Singly Circular Linked List, Doubly Linked Lists, Trees: Binary trees, Binary Search Trees, Threaded binary trees, Graphs: Depth First Search, Breadth First Search.

**SDL: Applications of recursion, additional binary tree operations. [ 4 hrs]**

**Syllabus**

**Introduction**

Recursion, accessing variables through pointers, pointer declaration and definition, initialization of pointer variables, pointers for inter function communication, pointers to pointers, Arrays and pointers, pointer arithmetic and arrays, passing an array to a function, memory allocation functions, array of pointers, Type Definition, Enumerated types, Structures, Sparse Matrix Representation.

**[8 Hours]**

**Stacks and Queues**

 Stacks, Queues, Evaluation of Expression, Infix, Postfix and Prefix expressions and their conversions, Priority Queues and their Representation, Input/Output Restricted Queues.

**[8 Hours]**

**Linked Lists**

Singly Linked List and Chains, Representing Chains in C, Linked Stacks and Queues, Polynomials, Additional List Operations, Doubly Linked Lists, Circular Linked Lists, Linked Lists with Header Node, Applications using linked lists.                                                    **[14 Hours]**

**Trees**

Terminology, Representation of Trees, Binary Trees, Binary Tree Traversals, Additional Binary Tree Operations, Threaded Binary Trees, Binary Search Trees - Definition, Searching a Binary Search Tree, Inserting into and Deletion from Binary Search Tree.                  **[11 Hours]**

**Graphs**

Introduction, Definitions, Graph Representations, Depth First Search, Breadth First Search.

**[3 Hours]**

**Course Outcomes** 

 At the end of this course, the students will be able to

1. Associate real world representation of information using structures and recursions.

2. Solve real world problems using concepts of queues and stacks.

3. Solve real world problems using linked list concepts.

4. Articulate Non-Linear Data Structures such as Trees.

5. Explain Graph representations and Graph traversals.

**References**

1. Behrouz A. Forouzan, Richard F. Gilberg,  *A Structured Programming Approach Using   C*,3rd Edition, Cengage Learning India Pvt. Ltd, India, 2007.

2. Ellis Horowitz, Sartaj Sahani, Susan Anderson and Freed, *Fundamentals of Data Structures in C*, 2nd Edition, Silicon Press, 2007.

3. Richard F. Gilberg, Behrouz A. Forouzan, Data structures, *A Pseudocode Approach with C,*2nd Edition, Cengage Learning India Pvt. Ltd, India , 2009.

4.Tenenbaum Aaron M., Langsam Yedidyah, Augenstein Moshe J*., Data structures using C,* Pearson Prentice Hall of India Ltd., 2007.

5. Debasis Samanta, *Classic Data Structures*, 2nd Edition, PHI Learning Pvt. Ltd., India, 2010.