| **CS-07: DATA STRUCTURE USING C LANGUAGE** | | |
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**Objective:** To learn algorithm analysis, data structures, sorting and searching techniques.

| Sr. No. | Topic | Detail |
|---|---|---|
| 1 | **Algorithm Analysis** | • The analysis of algorithm.<br>• Time and space complexities.<br>• Asymptotic notation.<br>• Classes of algorithm.<br>• Big-Oh Notation<br>• Big-Omega Notation |
| | **Advanced Concepts of C and Introduction To data Structures** | • Data types<br>• Arrays<br>• Handling arrays<br>   ▪ Initializing the arrays<br>• Multidimensional arrays<br>   ▪ Initialization of two dimensional array<br>• Pointers<br>   ▪ Advantages and disadvantages of pointers<br>   ▪ Declaring and initializing pointers<br>   ▪ Pointer arithmetic<br>• Array of pointers<br>• Passing parameters to the functions<br>• Relation between pointers and arrays<br>• Scope rules and storage classes<br>   ▪ Automatic variables<br>   ▪ Static variables<br>   ▪ External variables<br>   ▪ Register variable<br>• Dynamic allocation and de-allocation of memory<br>   ▪ function malloc(size)<br>   ▪ function calloc(n,size)<br>   ▪ function free(block)<br>• Dangling pointer problem.<br>• Structures.<br>• Enumerated constants<br>• Unions |
| 2 | **Sorting and Searching** | • Bubble sorting<br>• Insertion sorting<br>• Quick sorting<br>• Bucket sorting<br>• Merge sorting<br>• Selection sorting |

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| | | • Shell sorting |
| | | • Basic searching technique |
| | | • Index searching |
| | | • Sequential searching |
| | | • Binary searching |
| | **Graph** | Adjacency matrix and adjacency lists |
| | | Graph traversal |
| | |     Depth first search (dfs) |
| | |     Implementation |
| | |     Breadth first search (bfs) |
| | |     Implementation |
| | | • Shortest path problem |
| | | • Minimal spanning tree |
| 3 | **Introduction To data Structure** | Primitive and simple structures |
| | | Linear and nonlinear structures file organization. |
| | **Elementary Data Structure** | Stack |
| | |     Definition |
| | |     Operations on stack |
| | |     Implementation of stacks using arrays |
| | |     Function to insert an element into the stack |
| | |     Function to delete an element from the stack |
| | |     Function to display the items |
| | | Recursion and stacks |
| | | Evaluation of expressions using stacks |
| | |     Postfix expressions |
| | |     Prefix expression |
| | | Queue |
| | |     Introduction |
| | |     Array implementation of queues |
| | |     Function to insert an element into the queue |
| | |     Function to delete an element from the queue |
| | | Circular queue |
| | |     Function to insert an element into the queue |
| | |     Function for deletion from circular queue |
| | |     Circular queue with array implementation |
| | | Deques |
| | | Priority queues |
| 4 | **Link List** | Singly linked lists. |
| | |     Implementation of linked list |
| | |     Insertion of a node at the beginning |
| | |     Insertion of a node at the end |
| | |     Insertion of a node after a specified node |
| | |     Traversing the entire linked list |
| | |     Deletion of a node from linked list |

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| | | Concatenation of linked lists<br>Merging of linked lists<br>Reversing of linked list<br>Doubly linked list.<br>    Implementation of doubly linked list<br>Circular linked list<br>Applications of the linked lists |
| 5 | **Tree** | Objectives<br>Properties of a tree<br>Binary trees<br>    Properties of binary trees<br>    Implementation<br>    Traversals of a binary tree<br>        In order traversal<br>        Post order traversal<br>        Preorder traversal<br>Binary search trees (bst)<br>    Insertion in bst<br>    Deletion of a node<br>    Search for a key in bst<br>•  Height balanced tree<br>•  b-tree<br>    Insertion<br>    Deletion |

Seminar          - 5 Lectures
Expert Talk    - 5 Lectures
Test             - 5 Lectures
**Total Lectures 60 + 15 = 75**

**Reference Books:**
1. Data Structure through C/C++ Author : Tennaunbuam.
2. Let us C Author : Kanitkar.
3. Pointer in C Author : Kanitkar.
4. Data and File Structure Author : Trembley & Sorrenson.