Maulana Abul Kalam Azad University of Technology, West Bengal
Syllabus for B. Tech in Electronics & Communication Engineering
(Applicable from the academic session 2018-2019)

ES-CS301	Data Structure & Algorithms	3L:0T: 4P	3 credits

Objectives of the course:

1. To impart the basic concepts of data structures and algorithms.
2. To understand concepts about searching and sorting techniques
3. To understand basic concepts about stacks, queues, lists, trees and graphs.
4. To enable them to write algorithms for solving problems with the help of fundamental data structures

Detailed contents:

Module 1 **6L**

Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off.

Searching: Linear Search and Binary Search Techniques and their complexity analysis.

Module 2: **8L**

Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation - corresponding algorithms and complexity analysis. ADT queue,

Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

Module 3: **8L**

Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.

Module 4: **8L**

Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.

Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

Course Contents:		
Module No.	**Description of Topic**	**Contact Hrs.**
1	Introduction: Basic Terminologies: Elementary Data Organizations, Array, Data Structure Operations: insertion, deletion, traversal etc. Analysis of an Algorithm: Asymptotic Notations, Time-Space trade off. Searching: Linear Search and Binary Search algorithms and their complexity analysis, Interpolation Search algorithm. Recursion: Definition and Types with examples of each types, Tower of Hanoi problem and its complexity analysis.	6
2	Stacks and Queues: Stack as an ADT and its operations, Applications of Stacks: Expression Conversion and Evaluation – corresponding algorithms. Queue as an ADT: Types of Queue: Linear Queue, Circular Queue, Priority Queue; Operations on each types and their algorithms. Dequeue: Basic concept and associated algorithms.	6
3	Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Application of Linked list: representation of Polynomial and addition of two polynomials. Doubly linked list and Circular Linked List: Basic Concept and Operations.	6
4	Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, its properties, Complete and Strictly Binary Tree, Threaded Binary Tree, Binary Search Tree: insertion, deletion & traversal algorithms, AVL tree, Applications of Binary Trees. B Tree, B+ Tree: definitions and construction algorithms. Graph: Basic terminologies and Representations, Graph traversal algorithms (BFS and DFS), Minimal Spanning Tree algorithms (Prim's and Kruskal's).	12
5	Sorting and Hashing: Objective and properties of different sorting algorithms: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance analysis and comparison among all the methods; Hashing: Definition, Hash functions, Collision resolution techniques.	6
Total		**36L**