

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
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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.

Suggested books:

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“Fundamentals of Data Structures”, Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.

Suggested reference books:

1. Algorithms, Data Structures, and Problem Solving with C++”, Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
2. “How to Solve it by Computer”, 2nd Impression by R.G. Dromey, Pearson Education.
3. Expert Data Structures with C, R. B. Patel, Khanna Publishing House, New Delhi

Course outcomes

1. For a given algorithm student will able to analyze the algorithms to determine the time and computation complexity and justify the correctness.
2. For a given Search problem (Linear Search and Binary Search) student will able to implement it.
3. For a given problem of Stacks, Queues and linked list student will able to implement it and analyze the same to determine the time and computation complexity.
4. Student will able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.
5. Student will able to implement Graph search and traversal algorithms and determine the time and computation complexity.

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ES-CS391	Data Structure & Algorithm Lab.	0L:0T:2P	1 credits
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Experiments should include but not limited to :

Implementation of array operations:

Stacks and Queues: adding, deleting elements Circular Queue: Adding & deleting elements

Merging Problem : Evaluation of expressions operations on Multiple stacks & queues :

Implementation of linked lists: inserting, deleting, and inverting a linked list. Implementation of stacks & queues using linked lists:

Polynomial addition, Polynomial multiplication

Sparse Matrices : Multiplication, addition.

Recursive and Nonrecursive traversal of Trees

Threaded binary tree traversal. AVL tree implementation

Application of Trees. Application of sorting and searching algorithms

Hash tables implementation: searching, inserting and deleting, searching & sorting techniques.