Data Structures and Algorithms BCSE202L

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August 10, 2022

- **Course Objectives:**
  - To impart basic concepts of data structures and algorithms.
  - To differentiate linear, non-linear data structures and their operations.
  - To comprehend the necessity of time complexity in algorithms.

- **Course Outcome:** On completion of this course, student should be able to
  - Understand the fundamental analysis and time complexity for a given problem.
  - Articulate linear, non-linear data structures and legal operations permitted on them.
  - Identify and apply suitable algorithms for searching and sorting.
  - Discover various tree and graph traversals.
  - Explicate hashing, heaps and AVL trees and realize their applications.

Syallbus: MODULE - I

- **Algorithm Analysis**
  - Introduction and importance of Algorithms and Data Structures
  - Space and Time Complexity of an algorithm
  - Introduction to Asymptotic Notations and Order of Growth
  - Best, Average and Worst case of Algorithm efficiency
  - Analysis of Non-recursive Algorithms
  - Anslysis of Recursive Algorithms
  - Asymptotic analysis of recurrence relations
    - Iteration Method
    - Substitution Method
    - Master Theorem
    - Recursive Tree Method

Syallbus: MODULE - II

- **Linear Data Structure**
  - Introduction to 1D and 2D arrays
  - Introduction to Stacks with primitive operations
  - Applications of Stacks
    - Expression Evaluation
    - Conversion of Infix to postfix and prefix expression
    - Tower of Hanoi
  - Introduction to Queue with primitive operations
  - Types of Queues
    - Circular Queue
    - Double Ended Queue (deQueue)
  - Applications of Queues
  - Introduction to Linked List
  - Types of Linked Lists
    - Single Linked List
    - Double Linked List
    - Circular Linked List
  - Applications of Linked List : Polynomial Manipulation

Syallbus: MODULE - III

- **Searching and Sorting**
  - Introduction to Search
  - Linear Search
  - Binary Seach
  - Real time applications w.r.t searching
  - Introduction to Sorting
  - Different types of sorting w.r.t analysis
    - Insertion sort
    - Selection sort
    - Bubble sort
    - Counting sort
    - Quick sort
    - Merge sort

Syallbus: MODULE - IV

- **Trees**
  - Introduction to Tree, Binary Tree and its Terminology
  - Tree traversals
  - Introduction to Expression Trees
  - Introduction to Binary Search Trees (BST) w.r.t operations
    - Inserting a node in BST
    - Deleting a node in BST
    - Finding a max in BST
    - Finding a min in BST
    - Finding a k^{th} minimum element in BST

Syallbus: MODULE - V

- **Graphs**
  - Introduction to Graphs and its Terminology
  - Graph Traversals
    - Breadth First Search (BFS)
    - Depth First Search (DFS)
  - Introduction to Minimum Spanning Tree (MST)
    - Prim's Algorithm
    - Kruskal's Algorithm
  - Introduction to Path Problems in Graphs
  - Single Source Shortest Path Problem (SSSP)
    - Dijkstra's Algorithm

Syallbus: MODULE - VI

- **Hashing**
  - Introduction to Hashing and its terminology
  - Separate Chaining
  - Open hashing
    - Linear Probing
    - Quadratic Probing
  - Double hashing
  - Closed hashing and Random probing
  - Rehashing
  - Extensible Hashing

Syallbus: MODULE - VII

- **Heaps and AVL Trees**
  - Introduction to Heaps and Heap Sort
  - Applications of Heaps: Priority Queue
  - Introduction to AVL trees and its terminology
  - Operations on AVL trees
    - Rotations
    - Deletion
    - Insertion

Syallbus: MODULE - VIII

- **Contemporary Issues**
  - Guest Lecture by Industry Expert

Text Book

- Mark A. Weiss, Data Structures & Algorithm Analysis in C++, 4^{th} Edition, 2013, Pearson Education.

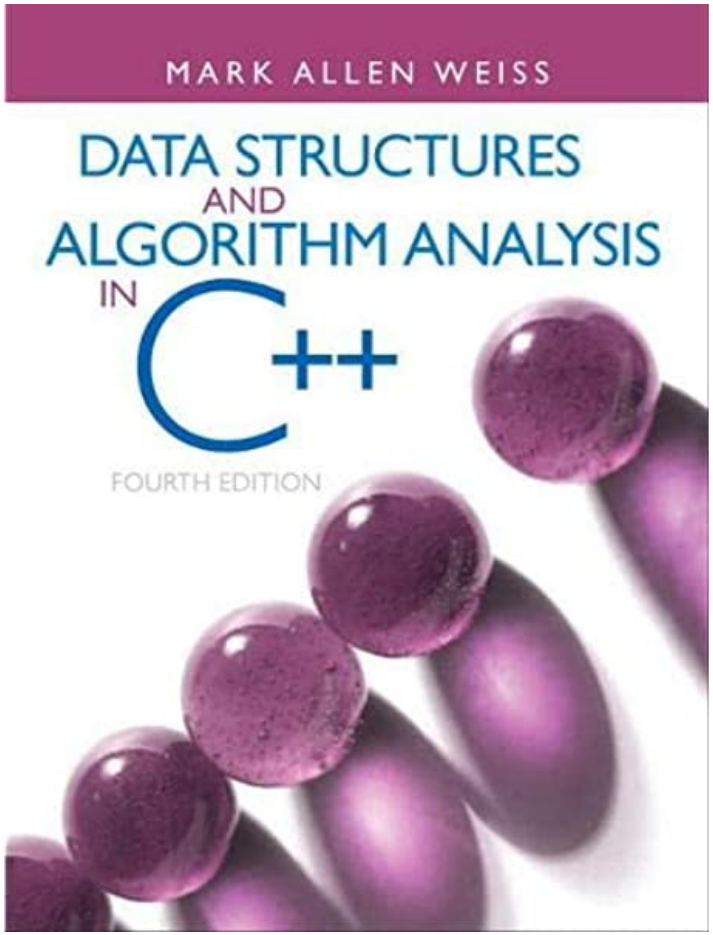
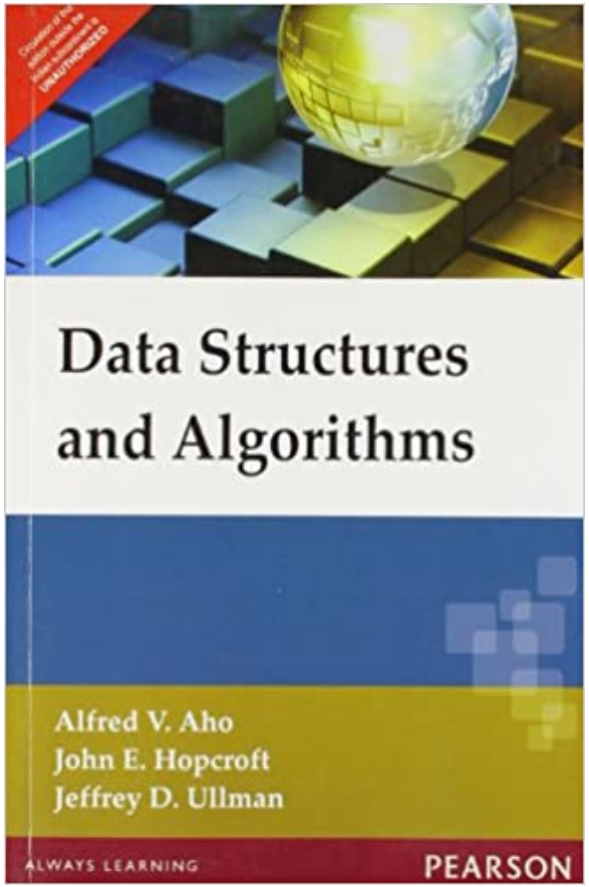


Figure: Front cover of the book

Reference Books

- Alfred V. Aho, Jeffrey D. Ullman and John E. Hopcroft, Data Structures and Algorithms, 1983, Pearson Education.



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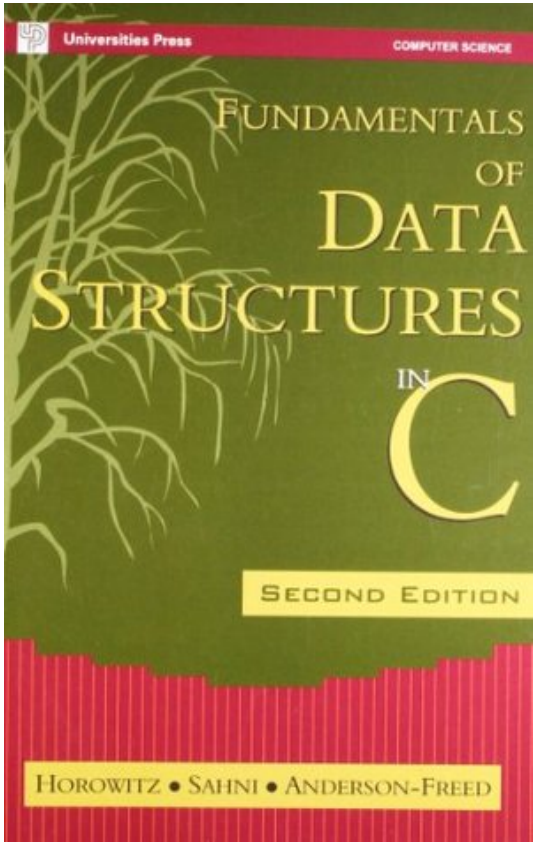
Reference Books

- Horowitz, Sahni and S. Anderson-Freed, Fundamentals of Data Structures in C, 2008, 2^{nd} Edition, Universities Press.



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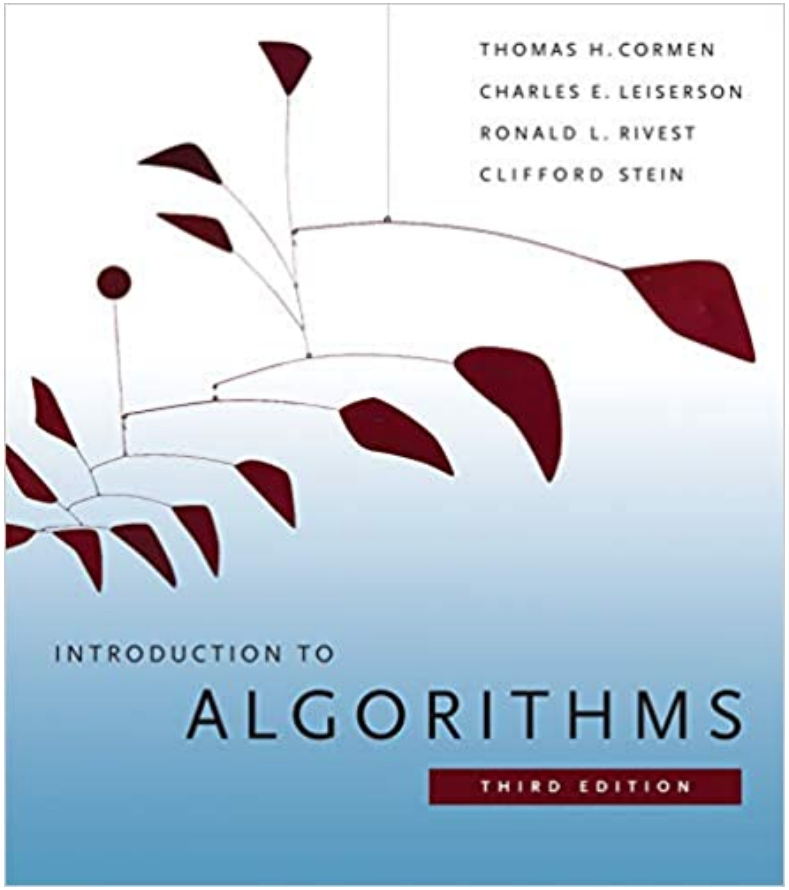
Reference Books

- Thomas H. Cormen, C.E. Leiserson, R L. Rivest and C. Stein, Introduction to Algorithms, 2009, 3^{rd} Edition, MIT Press.



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BCSE202L Theory Evaluation Procedure

Assessment	Marks
CAT - 1	15
CAT - 2	15
Quiz - 1	10
Quiz - 2	10
Quiz - 3	10
FAT	40
Total	100