Advanced Data Structures & Algorithms

Course Outcomes

Syllabus

Text Books

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Course Outcomes

CO1: Design an Algorithm and estimate the asymptotic performance of algorithms.

CO2: Synthesize design techniques and choose appropriate technique to solve problems.

CO3: Analyze algorithm design techniques to provide optimal solution for given problem.

CO4: Understand various operations on advanced tree data structures and asymptotic performance of algorithms.

Syllabus

- **<u>UNIT I:</u>**

Introduction:

  - What is an algorithm
  - Algorithm Specification: Pseudo code Conventions
  - Performance Analysis: Space & Time Complexity
  - Asymptotic Notations

Divide and conquer:

  - General method
  - Binary search
  - Finding the Maximum and Minimum
  - Merge sort
  - Quick sort
  - Strassen's matrix multiplication.

Syllabus

- **UNIT II:**

Greedy method:
- General method
- Knapsack problem
- Job Sequencing with deadlines
- Minimum cost spanning trees
- Single source shortest path problem.

Dynamic Programming:
- General method
- All pairs shortest Path problem
- Single source shortest paths: general weights
- Travelling sales person problem
- 0/1 knapsack problem
- String Editing

Syllabus

- **<u>UNIT III:</u>**

Backtracking:

- General Method
- 8-queens Problem
- Sum of Subsets
- Graph Coloring
- Hamiltonian Cycles.

Branch and Bound:

- The method: Least Cost (LC) Search
- Control Abstractions for LC-Search
- FIFO Branch-and-Bound
- 0/1knapsack problem
- Travelling salesperson problem.
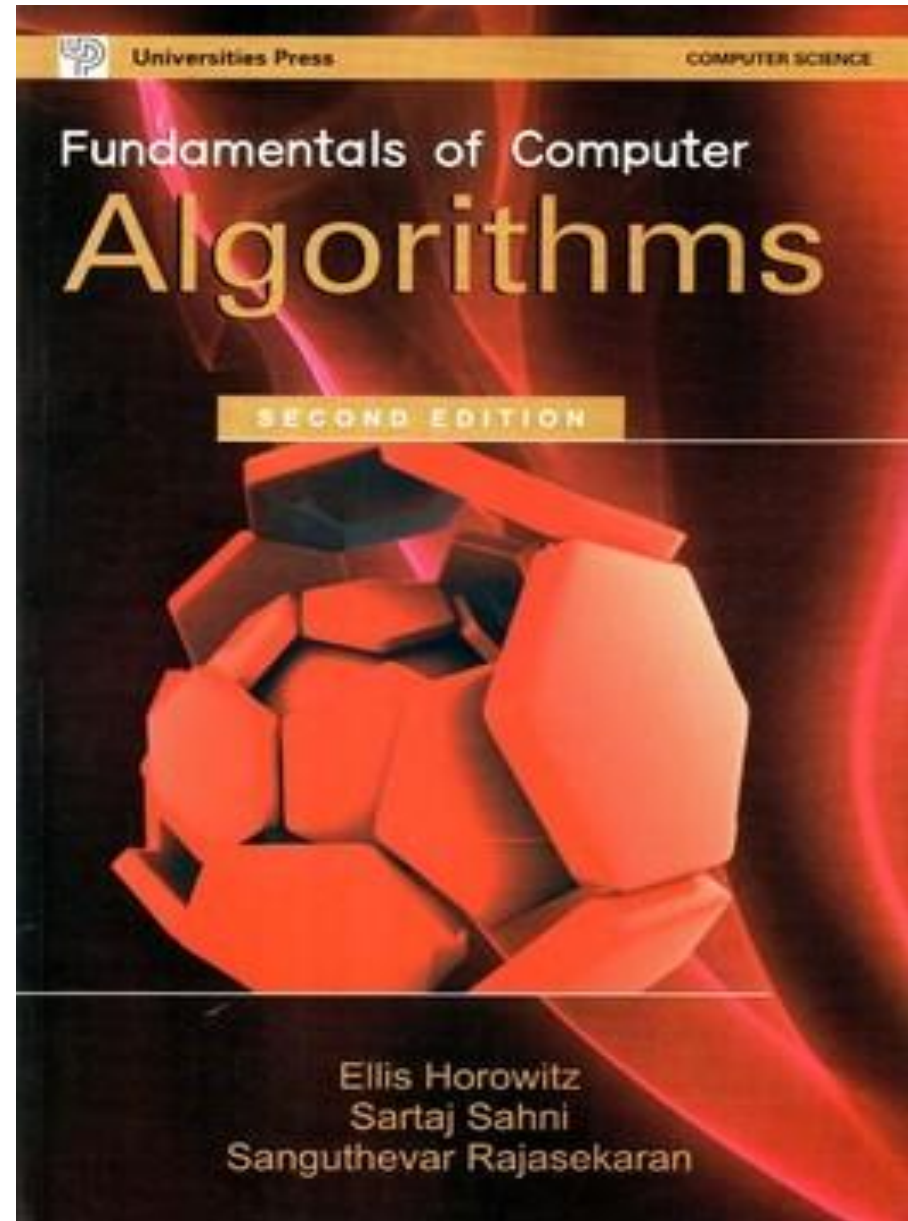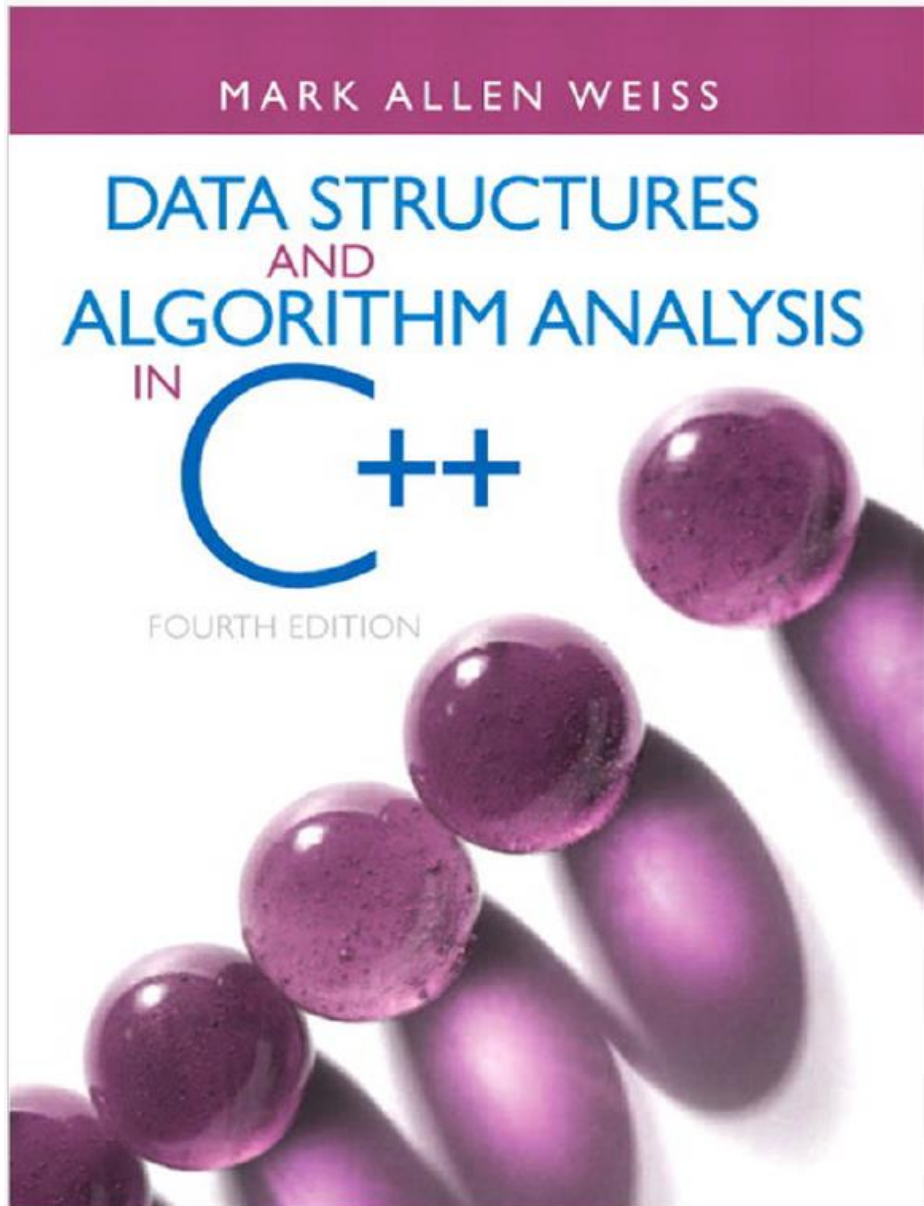
Syllabus

- **<u>UNIT IV:</u>**

Trees:

- AVL trees
- B-Trees
- Splay trees
- Red-Black trees
- Heap Trees(Priority queues)

NP-Hard and NP-Complete problems:

- Basic concepts
- Non-deterministic algorithms
- Classes P and NP
- NP Hard and NP Complete.

Text Books

MARK ALLEN WEISS

DATA STRUCTURES AND ALGORITHM ANALYSIS IN C++

FOURTH EDITION

Universities Press — COMPUTER SCIENCE

Fundamentals of Computer Algorithms

SECOND EDITION

Ellis Horowitz
Sartaj Sahni
Sanguthevar Rajasekaran

Other Reference Books

THOMAS H. CORMEN
CHARLES E. LEISERSON
RONALD L. RIVEST
CLIFFORD STEIN

INTRODUCTION TO
ALGORITHMS
THIRD EDITION

Second Edition

DESIGN
METHODS
AND
ANALYSIS OF
ALGORITHMS

S.K. Basu