fit@hcmus

DATA STRUCTURES & ALGORITHMS

Course Outline

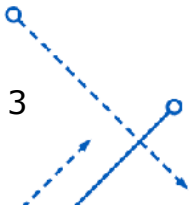
Lecturer: Dr. Nguyen Hai Minh

CONTENT

1. Overview
2. Goals
3. Teaching Plan
4. Grading
5. Resources
6. Course Policies

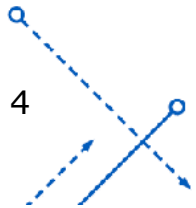
1. Overview

- This course contents 2 sections:
  1. Data Structures:
     - Linked list
     - Stack
     - Queue
     - Hash Table
     - Tree
     - Graph



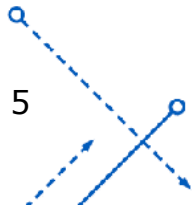
1. Overview

- This course contents 2 sections:
  2. Algorithms:
     - Some basic algorithms:
       - Sorting algorithms
       - Searching algorithms
       - Graph algorithms
     - Analysis of the Algorithms



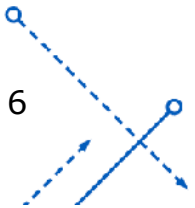
1. General

- Lecturer Info:
  - Email: ctduc@fit.hcmus.edu.vn



2. Goals

No.	Goal
1	Understand the role of data structure organizing in a computing project, the relationship between algorithms and data structures.
2	Understand the characteristics, pros and cons of each type of data structures.
3	Understand and analyze the complexity of the algorithms based on those data structures.
4	Design a data structure that fits in real life applications (apply known data structures and/or designing new data structures based on known ones).



2. Goals (cont.)

No.	Goal
5	Implement the learned data structures and algorithms using C/C++.
6	Comprehend the provided textbooks and references in English.
7	Work independently or in groups to solve problems using appropriate data structures and algorithms.

3. Teaching Plan

Week	Topic	Activities
1	Course outline	
	Chapter 1. Introduction to Data Structures 1. Basic Concepts 2. Linked List, Stack, Queue Review 3. Sequential Search, Binary Search Review	
2	Chapter 2. Introduction to Algorithm & Algorithm Analysis: 1. The Role of Algorithms in Computing 2. Algorithms Analysis Framework 3. Asymptotic notation 4. Mathematical Analysis of Algorithm 5. Sort: Selection Sort, Insertion Sort	I1, HW1

3. Teaching Plan

No.	Topic	Activities
3	Chapter 3. Advanced Sorts 1. Heap Sort 2. Merge Sort 3. Quick Sort 4. Counting Sort 5. Radix Sort	
4	Chapter 4. Hash 1. Hash function 2. Collision resolving by Chaining 3. Probing: linear, quadratic, double hashing	I2, HW2, HW3
5	Chapter 5. Tree Data Structures 1. Trees 2. Binary Search Tree	I3, HW4
6	Midterm Examination	

3. Teaching Plan

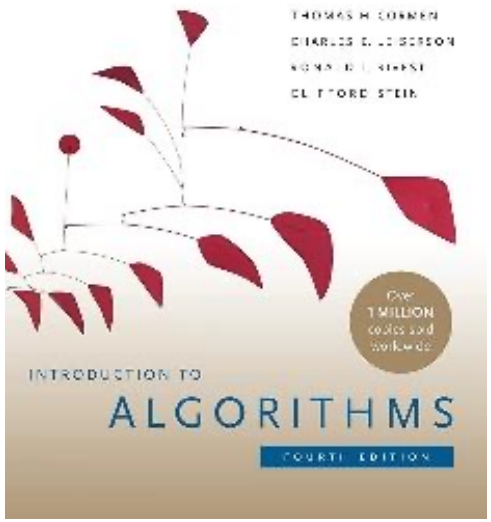
No.	Topic	Activities
7, 8	Chapter 5. (cont) 4. AVL-Tree 5. Red-Black Tree 6. B-Tree, 2-3 Tree, 2-3-4 Tree 7. Priority Queue	I4, HW5, HW6
9, 10	Chapter 6. Graphs 1. Introduction 2. Graph Representation 3. Graph Traversal: BFS, DFS, Dijsktra 4. Spanning Tree 5. Finding Shortest Path - Dijkstra	I5, HW7
11	Final Review	

4. Grading

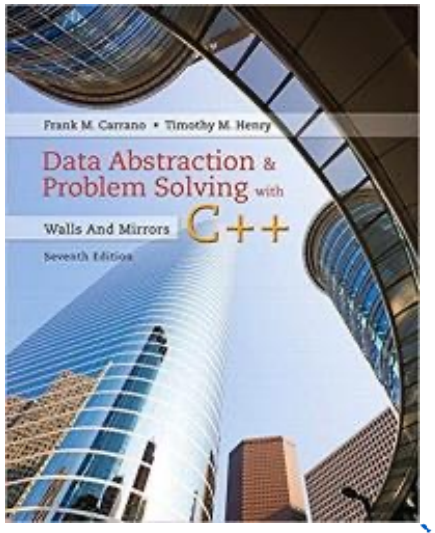
No.	Assessment	Description	Rate
1	05 quizzes (Q1—Q5)	Small in-class quizzes for each topic	15%
2	Mid term	Closed book exam.	10%
3	Final term	Limited open book exam	40%
4	Lab work	Practice part. HW, project, mid term and final term	35%
5	Bonus	For giving solution, contributing to lectures.	10%
		Total credits	**110%**

5. Resources

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, **Introduction to Algorithms** (4th Edition), The MIT Press, 2022

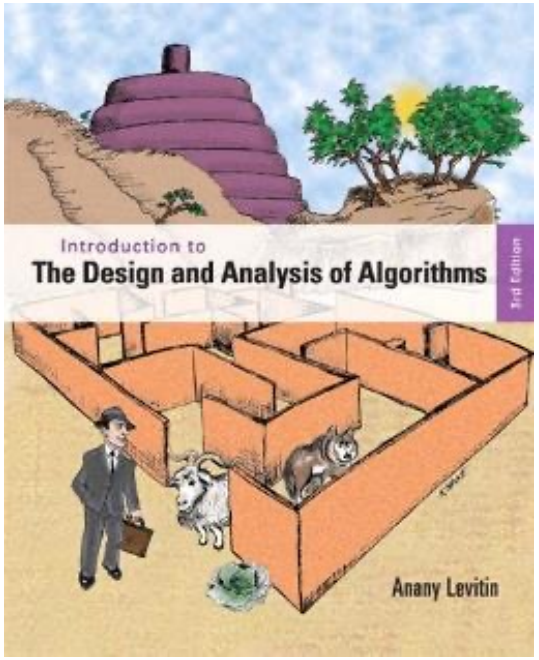


2. Frank M. Carrano, Timothy Henry, **Data Abstraction and Problem Solving with C++**, Wall and Mirrors (7th Edition), Pearson, 2016



5. Resources

3. Anany Levitin, **Introduction to the Design and Analysis of Algorithms**, (3rd Edition), Pearson, 2011



5. Resources

- Language:
  - C++ (Console mode)
- Integrated Development Environment (IDE):
  - Any C/C++ IDE
  - Visual Studio is preferred.

6. Course Policies

- What you should do:

6. Course Policies

- What you are prohibited:

0 score for any frauds or plagiarisms in doing assignments and projects


Q&A