

COURSE SYLLABUS

CSC10004 – Data Structures and Algorithms

1. GENERAL INFORMATION

Course name: Data Structures and Algorithms

Course name (in Vietnamese): Cấu trúc dữ liệu và Giải thuật

Course ID: CSC10004

Knowledge block:

Number of credits: 4

Credit hours for theory: 45

Credit hours for practice: 30

Credit hours for self-study: 90

Prerequisite:

Prior-course: Programming Technique

Instructors: Nguyen Thanh Phuong

2. COURSE DESCRIPTION

The course is designed to investigate the essential properties of data structures and algorithms for operating on them; to use these data structures as tools to assist algorithm design; to extend exposure to searching, sorting, hashing and recursive techniques. Above all, the goal for students in this course is to continue developing and improving skills in analysis, design, programming, and testing.

3. COURSE GOALS

Students who complete this course should be able to do the following things:

ID	Description	Program LOs
G1	Make appropriate data structure and algorithm design decisions with respect to program size, execution speed, and storage efficiency.	
G2	Understand common data structures (such as arrays, priority queues, trees, heaps, graphs) and the algorithms that build and manipulate them.	
G3	Understand and use basic algorithm analysis including both theoretical and empirical methods.	

4. COURSE OUTCOMES

CO	Description	I/T/U
G1.1		
G1.2		

5. TEACHING PLAN

ID	Topic	Course outcomes	Teaching/Learning Activities (samples)
1	General introduction to data structures and algorithms		Lecturing Q&A
2	Introduction to algorithm analysis		Lecturing Q&A, discussion
3	Elementary sorting algorithms		Lecturing Q&A, discussion

4	Efficient sorting algorithms		Lecturing Q&A, discussion
5	Non-comparison-based sorting algorithms		Lecturing, Q&A, discussion
6	Introduction to trees, binary trees and binary search trees		Lecturing Q&A, discussion
7	AVL tree, Red-Black tree		Lecturing, Q&A Demonstration, discussion
8	B-tree		Lecturing, Q&A Demonstration, discussion
9	Introduction to graph, graph traversals (BFS and DFS)		Lecturing Q&A, discussion
10	Graph algorithms (topological sorting, (minimum) spanning tree, shortest paths, ...)		Lecturing Q&A, discussion
11	Hash tables, Priority queue		Lecturing Q&A, discussion

For the practical laboratory work, there are 10 weeks which cover similar topics as it goes in the theory class. Each week, teaching assistants will explain and demonstrate key ideas on the corresponding topic and ask students to do their lab exercises either on computer in the lab or at home.

6. ASSESSMENTS

ID	Topic	Description	Course outcomes	Ratio (%)
A1	Labworks			30%
A2	Project			10%

A2	Exams			60%
A21	Midterm exam	Closed book exam. Describe the understanding of different topics, analyze & program to solve problems		20%
A22	Final exam	Closed book exam. Describe the understanding of different topics, analyze & program to solve problems		40%

7. RESOURCES

Textbooks

- N. Wirth, *Algorithms + Data Structures = Programs*, Prentice-Hall, 1976.
- A. Drozdek, *Data Structures and Algorithms in C++*, 4th Edition, Cengage Learning, 2013.
- D. S. Malik, *C++ Programming: Program Design including Data Structures*, 8th Edition, Cengage Learning, 2017.

Others

- Powerpoint slides, Internet are also useful resources for learning.

8. GENERAL REGULATIONS & POLICIES

- All students are responsible for reading and following strictly the regulations and policies of the school and university.
- For any kind of cheating and plagiarism, students will be graded 0 for the course. The incident is then submitted to the school and university for further review.
- Students are encouraged to form study groups to discuss on the topics. However, individual work must be done and submitted on your own.



- Programming assignments must compile with C++ compiler. No credit will be given for code that does not compile. This means that all components of a program must compile together, or student will not receive any credit for any of them.
- You are highly recommended to attend and actively participate in all class sessions. You must keep yourselves well informed of all the materials presented in class in any form such as documents or oral/written notification while you are absent.