TRƯỜNG ĐẠI HỌC BÁCH KHOA HÀ NỘI
VIỆN CÔNG NGHỆ THÔNG TIN VÀ TRUYỀN THÔNG

Data structures and Algorithms

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Data structures and Algorithms

When you tell your friends or your family that you are student of Global ICT program, and you are taking “Data structure and algorithm” course, can you explain what it is about?

The content of this class

- Introduce and examine the basic properties of data structures and algorithms.
- Learn how to use data structures as a tool to support algorithm development.
- Present algorithms for sorting, searching, algorithms on graphs.

The goal of this class

- Know how to choose the appropriate data structure to implement algorithms to solve problems in real applications.
- Know the approach to developing algorithms to solve real-world problem.

Course content

Chapter 1. Fundamentals

1.1. Introductory Example

1.2. Algorithm and Complexity

1.3. Pseudocode

1.4. Asymptotic notation

1.5. Running time calculation

Course content

Chapter 2. Algorithmic paradigms

- 2.1. Recursion
- 2.2. Recursion with memorization
- 2.3. Backtracking
- 2.4. Branch and bound
- 2.5. Greedy
- 2.6. Divide and conquer
- 2.7. Dynamic programming

Course content

Chapter 3. Basic Data Structures

- 3.1. Basic concepts
- 3.2. Array
- 3.3. Lists
- 3.4. Stack
- 3.5. Queue

Chapter 4. Tree

- 4.1. General Tree
- 4.2. Binary Tree
- 4.3. Operations

Course content

Chapter 5. Sorting

Course content

Chapter 6. Searching

6.1. Linear Search and Binary Search

6.2. Binary Search Tree

6.3. AVL tree

6.4. Hashing and applications

Course content

Chapter 7. Graph

7.1. Definitions and Notations

7.2. Graph representation

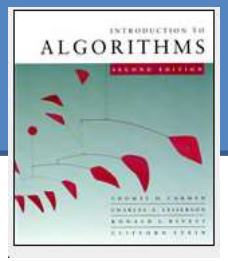
7.3. Graph traversal

7.4. Minimum Spanning Tree & Disjoint Set data structures

7.5 Shortest path algorithms and priority queues

Text books

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest. *Introduction to Algorithms* . Second Edition, MIT Press, 2001. 1202 pages. (Có bản dịch tiếng Việt)
2. Robert Sedgewick. Algorithms in C++, Parts 1-4: Fundamentals, Data Structures, Sorting, Searching. 3th Edition, Addison-Wesley, 1999.
3. Robert Sedgewick. Algorithms in C++ Part 5: Graph Algorithms (3rd Edition). 3th Edition, Addison-Wesley, 2002.
4. Michael T. Goodrich, Roberto Tamassia, David M. Mount, *Data Structures and Algorithms in C++*. 704 pages. Wiley, 2003.
5. Nguyễn Đức Nghĩa. . *Cấu trúc dữ liệu và thuật toán.* NXB Đại học Bách khoa Hà nội, 2013. 368 trang.
6. Đỗ Xuân Lôi. *Cấu trúc dữ liệu và giải thuật*. NXB ĐH Quốc gia, Hà nội, 2005.



T.H. Cormen, C.E. Leiserson, R.L. Rivest., C. Stein
Introduction to Algorithms .
Second Edition, MIT Press, 2001.

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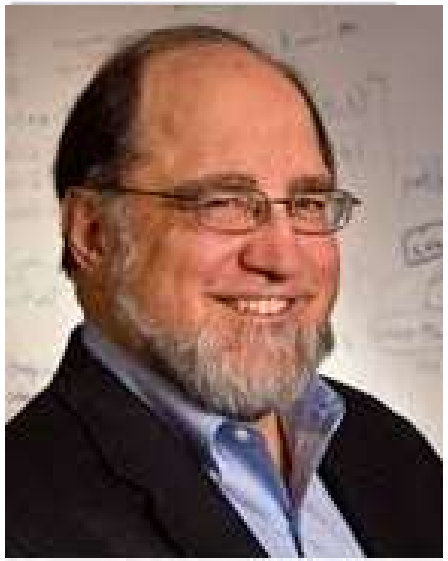

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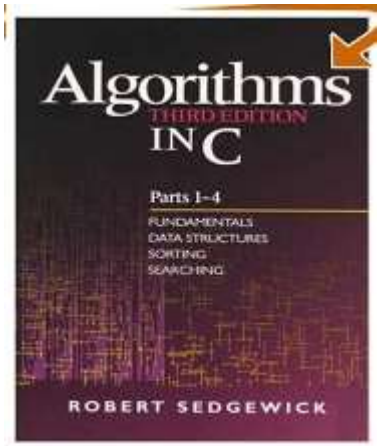
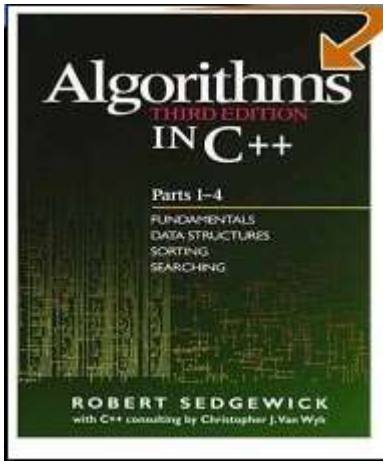
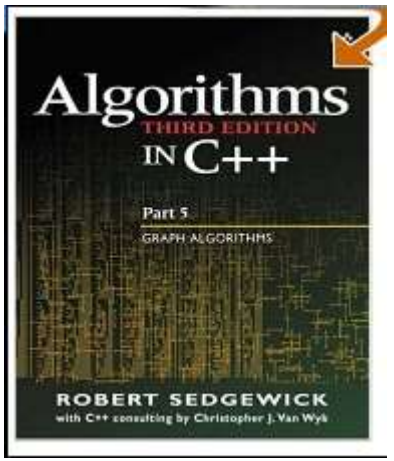
Text books







Robert Sedgewick

William O. Baker Professor
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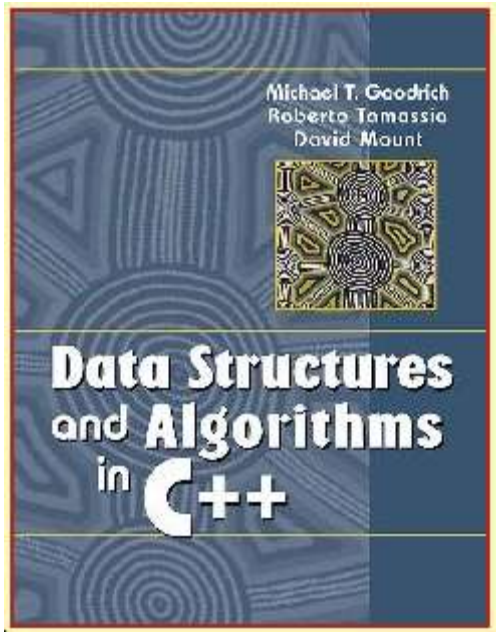

- **Michael T. Goodrich**

  Chancellor's Professor at the Department of Computer Science, University of California,
- **Roberto Tamassia**

  Professor, Department of Computer Science, Brown University
- **David Mount**

  Professor in the Department of Computer Science and UMIACS.

Text books

- Nguyễn Đức Nghĩa. *Cấu trúc dữ liệu và thuật toán.* NXB Đại học Bách khoa Hà nội, 2013. 368 trang.

A story before starting….

How Obama got the programmer vote in the 2008 United States Presidential Campaign

Barack Obama got asked a computer science question by Google CEO Eric Schmidt