

Introduction to Algorithm Practice

Department: Fudan International Summer Session 2022

Course Code			
Course Title	Introduction to Algorithm Practice		
Credit	2	Credit Hours	36 credit hours + 3 tutorial hours (one credit hour is 45 minutes)
Course Nature	<input type="checkbox"/> Specific General Education Courses <input type="checkbox"/> Core Courses <input checked="" type="checkbox"/> General Education Elective Courses <input type="checkbox"/> Basic Courses in General Discipline <input type="checkbox"/> Professional Compulsory Courses <input type="checkbox"/> Professional Elective Courses <input type="checkbox"/> Others		
Course Objectives	Making students overview the system “data structure + algorithm = program”; and polishing students’ programming skills by solving problems using algorithms.		
Course Description	<p>The course combines practice with theory, and overviews solving problems by programming, data structure, and algorithms.</p> <ol style="list-style-type: none"> 1. Fundamental Programming Skills Simple Computing; Simple Simulation; Recursion; Sorting; 2. Practice for Data Structure Practice for Linear Lists: Applications of Arrays and Character Strings; Application of Stacks and Queues; Practice for Tree: Practice for Tree Structure; Application of binary trees; Practice for Graph: Application of Graph Traversal; Applications of Minimum Spanning Trees; Applications of Shortest Paths; 3. Practice for Algorithms and Mathematics Practice for Ad Hoc; Complex Simulation; Applications for Number Theory and Combinatorics; Application for Greedy Algorithms; Application for Dynamic Programming. 		
Course Requirements:			
Prerequisites: Programming Language.			
Students not only overview the system for algorithm analysis and design, but also practice solving problems by programming by using algorithms.			
Teaching Methods:			
<ol style="list-style-type: none"> 1. Lectures (90 minutes): Introducing knowledge background; showing related programming contest problems; then analyzing solutions to problems. The teaching model for lectures is case teaching. 2. Practice (45 minutes): Setting a mock programming contests, instructing students to solve problems by programming. Online judge systems are the informatization technology used in the course. 			
Instructor’s Academic Background:			
Dr. Yonghui Wu serves as Associate Professor at the School of Computer Science at Fudan University,			

China. He acted the coach of Fudan University Programming Contest teams from 2001 to 2011. Under his guidance Fudan University was qualified for ACM ICPC World Finals every year and won three medals (bronze medal in 2002, silver medal in 2005, and bronze medal in 2010) in ACM ICPC World Finals. Since 2012, he has published a series of books for programming contest and education covering data structures, algorithms and strategies in simplified and traditional Chinese and English. Since 2013, he has been giving lectures in Oman, Taiwan, HongKong, Macau, Malaysia, Bangladesh and the United States for programming training. He is currently the chair of the ICPC Asia Programming Contest 1st Training Committee.

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Course Schedule:

4 weeks, 3 lectures/week, 3 credit hours/lecture (1 credit hour = 45 min)

Day 1: Introduction to the course, Simple Computing, Practice for Simple Computing

Day 2: Simple Simulation; Recursion; Practice for Simulation

Day 3: Sorting, Overview for Programming Practice for Sorting

Day 4: Applications of Arrays, Practice for Arrays

Day 5: Applications of Character Strings; Application of Stacks and Queues; Practice for Stacks

Day 6: Applications for Tree Structure; Application of binary trees; Practice for binary trees

Day 7: Applications for Graph Traversal, Pushing Boxes; Practice for Graph Traversal

Day 8: Applications of Minimum Spanning Trees; Applications of Shortest Paths; Practice for Graph

Day 9: Ad Hoc problems; Complex Simulation; Practice for Ad Hoc

Day 10: Applications for Number Theory and Combinatorics, Practice for Number Theory and Combinatorics

Day 11: Application for Greedy Algorithms; Application for Dynamic Programming; Practice for Greedy Algorithms and Dynamic Programming

Day 12: Examination

The design of class discussion or exercise, practice, experience and so on:

Students are put into a case of a problem description, apply knowledge that they have learned, think how to solve the problem. And after the algorithm solving the problem is showed, students try to program and debug to pass all test cases within the time and memory limit.

The process combines practice with thinking, stimulates students' desire for knowledge, and deepens their understanding knowledge. Therefore such a process promotes teaching innovation and course construction based on programming contest problems.

Grading & Evaluation:

Homework (solving problems): 50%

Examination: 50%

Teaching Materials & References:

[1] Wu Yonghui, Wang Jiande. Algorithm Design Practice : for Collegiate Programming Contest and Education. (English Version). CRC Press. 2018. ISBN 9781498776639

[2] Wu Yonghui, Wang Jiande. Data Structure Practice : for Collegiate Programming Contest and

Education. (English Version). CRC Press. 2016. ISBN 9781482215397 - CAT# K22004