上海交通大學
SHANGHAI JIAO TONG UNIVERSITY

Shanghai Jiao Tong University

CS249 Algorithms and Analysis

Instructor Information:	Prof. An xiangdong.an@hotmail.com Office Hours: Determined by Instructor		
Term:	December 16, 2019 - January 7, 2020	**Credits:**	4 units
Class Hours:	Monday through Friday, 160 mins per teaching day		
Discussion Sessions:	2.6 hours each week, conducted by teaching assistant(s)		
Total Contact Hours:	64 contact hours (1 contact hour = 45 mins, 2880 mins in total)		
Required Texts (with ISBN):	Recommended Texts: T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, 2009, Introduction to Algorithms, 3rd edition, The MIT Press. ISBN: 978-0-262-03384-8. E. Horowitz, S. Sahni and S. Rajasekaran, 1998, Computer Algorithms, Computer Science Press. ISBN: 0-7167-8316-9.		
Prerequisite:	Students are expected to have a good knowledge of basic data structures and algorithms.		

Course Overview

Introduction to advanced data structures and algorithms in computer science including key algorithmic design paradigms such as divide and conquer, greedy, dynamic programming. Topics include balanced search trees, heaps, efficient algorithms for sorting, searching and graph problems.

Learning Outcomes

A student who satisfactorily completes this course should be able to accomplish the following:

1. Find and prove runtime bounds for iterative and recursive algorithms;
2. Design efficient algorithms to solve computational problems;
3. Understand and employ algorithmic design paradigms including divide and conquer, dynamic programming, and greedy algorithms in solving varied computational problems;
4. Implement complex algorithms and data structures with a modern high level programming language.

Grading Policy

Part	Percentage
Attendance	10%
Quizzes	10%
Assignments	40%
Midterm	20%
Final Exam	20%
Course Total	100%

Grading Scale

Number grade	Letter grade	GPA
90-100	A	4
85-89	A-	3.7
80-84	B+	3.3
75-79	B	3
70-74	B-	2.7
67-69	C+	2.3
65-66	C	2
62-64	C-	1.7
60-61	D	1
≤59	F (Failure)	0

Class Schedule

Date	Content	Readings
Day 1	Definition of Algorithm, Pseudocode Conventions, Recursive Algorithms, Insertion Sort, Correctness	CLRS: 2.1, 2.2 HSR: 1.2
Day 2	Time and Space Complexities, Common Functions, Mathematical Preliminaries	CLRS: 3.1, 3.2 HSR: 1.3
Day 3	Divide and Conquer - Merge Sort	CLRS: 2.3 HSR 3.4
Day 4	Divide and Conquer – Quicksort, Quicksort Analysis, Randomized Quicksort	CLRS: 7.1-7.3 HSR: 3.5
Day 5	Heaps and Heapsort	CLRS: 6.1-6.4 HSR: 2.4.1-2.4.2
Day 6	Lower Bounds for Sorting, Radix Sort	CLRS: 8.1, 8.3
Day 7	**Midterm Exam**	
Day 8	Approximation Algorithms, Local Search, Travelling Salesman Problem	CLRS: 35.2
Day 9	Binary Search, Binary Search Trees and AVL Trees	CLRS: 12.3 HSR: 2.3.1
Day 10	Graphs and Search of Graphs, DFS, BFS	CLRS: 22.1-22.3 HSR: 6.2.1-6.2. 2
Day 11	Greedy Algorithms - Minimum Spanning Trees	CLRS: 23.2 HSR: 4.5.1-4.5.2
Day 12	Dynamic Programming – Single Source Shortest Paths	CLRS: 24.3 HSR: 5.1, 5.4
Day 13	Dynamic Programming – All Pairs Shortest Paths	CLRS 25.2 HSR: 5.3
Day 14	Greedy algorithms – Huffman Codes	CLRS: 16.3
Day 15	**Final Exam**	