

Syllabus

San José State University

Department of Computer Science

CS 146, Data Structures and Algorithms, sections 5 and 6, Spring 2017

Course and Contact Information

Instructor: Jenny Lam

Office location: MacQuarrie Hall 211 (MH 211)

Email: jenny.lam01@sjsu.edu

Office hours: TTh 10:45–11:45AM or by appointment

Section 5: TTh 9:00AM–10:15AM, MH 222

Section 6: TTh 12:00PM–13:15PM, MH 225

Prerequisites: MATH 030, MATH 042, CS 049J (or equivalent knowledge of Java), and CS 046B (with a grade of “C-“ or better in each); or instructor consent.

Course Description

Implementations of advanced tree structures, priority queues, heaps, directed and undirected graphs. Advanced searching and sorting (radix sort, heapsort, mergesort, and quicksort). Design and analysis of data structures and algorithms. Divide-and-conquer, greedy, and dynamic programming algorithm design techniques.

Course Learning Outcomes (CLO)

Upon successful completion of this course, students will be able to:

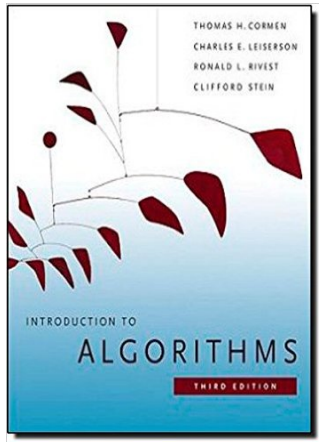
1. Understand the implementation of lists, stacks, queues, search trees, heaps, union-find ADT, and graphs and be able to use these data structures in programs they design
2. Prove basic properties of trees and graphs
3. Perform breadth-first search and depth-first search on directed as well as undirected graphs
4. Use advanced sorting techniques (heapsort, mergesort, quicksort)
5. Determine the running time of an algorithm in terms of asymptotic notation
6. Solve recurrence relations representing the running time of an algorithm designed using a

divide-and-conquer strategy

7. Understand the basic concept of NP-completeness and realize that they may not be able to efficiently solve all problems they encounter in their careers
8. Understand algorithms designed using greedy, divide-and-conquer, and dynamic programming techniques

Required Texts/Readings

Textbook



Cormen, Leiserson, Rivest and Stein, Introduction to Algorithms, 3rd Edition

ISBN-10: 0262033844

ISBN-13: 978-0262033848

MIT Press, 2009

[Errata \(bug reports\)](http://www.cs.dartmouth.edu/~thc/clrs-bugs/bugs-3e.php) at <http://www.cs.dartmouth.edu/~thc/clrs-bugs/bugs-3e.php>

Programming environment

Java compiler (version 8)

Course Requirements and Assignments

The grade in this course will be weighted as follows:

Participation: although there is no grade incentive, students are expected to attend every class and actively participate.

Assignments: (20%) assignments are assigned roughly every week and will consist of a mix of programming and written problems. Students may discuss approaches to solving problems, but all work that is turned in must be done individually. The two lowest grades will be dropped. Late work is not accepted for any reason.

Exams: (25% each) there will be two in-class exams. Missed exams can only be rescheduled if there

are verifiable emergency circumstances. Makeup exams may be oral.

Final exam: (30%) the final exam is comprehensive. In accordance with University Policy S06-4, final examinations may be rescheduled if there are verifiable emergency circumstances; or if a student has more than two exams scheduled within a 24-hour period. In this case, the student may request an alternative exam date from any one of the instructors at least three weeks prior to the last class meeting. The makeup final exam may be an oral exam.

Letter grade: the final numerical score will translate to the course letter grade according to the following scale:

Percentage Letter grade

[90-100)	A
[75-90)	B
[60-75)	C
[50-60)	D
[0-50)	F

University Policies

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs' [Syllabus Information web page](http://www.sjsu.edu/gup/syllabusinfo/) at <http://www.sjsu.edu/gup/syllabusinfo/>

Schedule

This schedule is tentative and subject to change during the semester. Changes will be reflected on this page as well as announced during lecture. Students should consult this schedule regularly for the most up-to-date information.

Date	Topic	Reading/homework
Th 1/26	Introduction	1.1, 1.2 (skim) 3.1 (O and Θ)
T 1/31	Recursion: simplify-and-delegate	Ch 2
Th 2/2	Recursion: Towers of Hanoi, mergesort Review: summation notation, induction <i>Last day to drop</i>	4.1
T 2/7	Recursion: recurrence equations Review: logarithms, O-notation	4.3
Th 2/9	Recursion: divide-and-conquer Review: worse case time complexity	33.4
T 2/14	Recursion: backtracking	Erickson notes (just 3.1, 3.3, 3.6)

Date	Topic	Reading/homework
Th 2/16	<i>Last day to add</i> Recursion: dynamic programming	15.1
T 2/21	Recursion: dynamic programming	
Th 2/23	Data structures: stacks, space complexity of recursive algorithms, find the convex hull	10.1, 10.2 (skim) 33.3 (Graham scan)
T 2/28	Data structures: priority queues, heaps, selection and heapsort	Ch 6 and/or Binary heaps (videos 1-4) - Prof Taylor
Th 3/2	Data structures: dictionaries, BSTs	12
T 3/7	Exam 1	
Th 3/9	Data structures: red-black trees	13
T 3/14	Randomization: hashing 1: hash tables, hash chaining, hash functions	11.1-11.3
Th 3/16	Randomization: hashing 2: table resizing (section 8 only), open addressing	11.4
T 3/21	Randomization: deterministic and randomized quicksort Review of basic probability, expectation, indicator variables	7.1-7.3
Th 3/23	Randomization: skiplists	
T 3/28	<i>Spring recess</i>	
Th 3/30	<i>Spring recess</i>	
T 4/4	Randomization: analysis of randomized quicksort Proof using indicator variables	7.4
Th 4/6	Graphs: representation, DFS, strongly connected components	22.1, 22.3
T 4/11	Graphs: Tarjan's algorithm for strongly connected components	22.5
Th 4/13	Graphs: BFS, single-source shortest path problem, Dijkstra	22.2, 24.3
T 4/18	Graphs: Bellman-Ford algorithm	24.1-24.2
Th 4/20	Graphs: minimum spanning trees	23.1-23.2
T 4/25	Exam 2	
Th 4/27	Hardness: sorting and search lower bounds	8.1
T 5/2	Hardness: radix sort,	8.3

Date	Topic	Reading/homework
Th 5/4	Hardness: NP-completeness	Ch 34 (skim)
T 5/9	Hardness: approximation algorithms	Ch 35 (skim)
Th 5/11	Flex	
T 5/16	Review	
T 5/23	Section 5 final exam T 5/23 7:15AM–9:30AM, MH 222	
W 5/24	Section 6 final exam W 5/24 9:45AM–12:00PM, MH 225	