SJSU SAN JOSÉ STATE UNIVERSITY

College of Science · Computer Science

Data Structures and Algorithms Section 07

CS 146

Spring 2024 3 Unit(s) 01/24/2024 to 05/13/2024 Modified 01/19/2024

Contact Information

Instructor: Doug Case

Email: doug.case@sjsu.edu

Office Hours: Monday and Wednesday 7:15 PM – 7:45 PM (after class in DH 450). Also, by appointment.

Classroom: DH 450

Day/Time: Mondays and Wednesdays 6:00 PM – 7:15 PM

Course Description and Requisites

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

Prerequisite(s): MATH 30, MATH 42, CS 46B, and [(CS 48 or CS 49J) if CS 46B was not in Java], each with a grade of "C-" or better; Computer Science, Applied and Computational Math, Forensic Science: Digital Evidence, Software Engineering, Data Science majors only; or instructor consent.

Letter Graded

Classroom Protocols

Communication with the instructor

Students are requested to use the provided email to contact the instructor.

Classroom Protocol

Course material developed by the instructor is the intellectual property of the instructor. Students cannot publicly share or upload instructor generated material for this course such as exam questions, Programming assignment, lecture notes, lecture slides, hands-on exercises or homework solutions without instructor permission.

Program Information

Diversity Statement - At SJSU, it is important to create a safe learning environment where we can explore, learn, and grow together. We strive to build a diverse, equitable, inclusive culture that values, encourages, and supports students from all backgrounds and experiences.

Course Learning Outcomes (CLOs)

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

- Implement lists, stacks, queues, search trees, heaps, union-find ADT (Abstract Data Type), and graphs and use these data structures in programs they design.
- Prove basic properties of trees and graphs.
- Perform breadth-first search and depth-first search on directed as well as undirected graphs.
- Use advanced sorting techniques (radix sort, heapsort, mergesort, quicksort).
- Determine the running time of an algorithm in terms of asymptotic notation.
- Solve recurrence relations representing the running time of an algorithm designed using a divide-and-conquer strategy.
- Comprehend the basic concept of NP-completeness and realize that they may not be able to efficiently solve all problems they encounter in their careers.
- Comprehend algorithms designed using greedy, divide-and-conquer, and dynamic programming techniques.

Course Materials

Textbook:

Cormen, Leiserson, Rivest, and Stein, Introduction to Algorithms, third edition. MIT Press, 2009. ISBN-10: 0262033844 ISBN-13: 978-0262033848

Other technology requirement / equipment / material:

You will need a wireless laptop with internet access. All students are required to have access to a wireless laptop (running OSX, Windows, or some version of UNIX), upon which you can install required software. Technology used will include Canvas, programming in Java, and an IDE (Integrated Development Environment).

Course Requirements and Assignments

SJSU classes are designed such that in order to be successful, it is expected that students will spend a minimum of forty-five hours for each unit of credit (normally three hours per unit per week), including preparing for class, participating in course activities, completing assignments, and so on. More details about student workload can be found in University Policy S12-3 (http://www.sjsu.edu/senate/docs/S12-3.pdf)at http://www.sjsu.edu/senate/docs/S12-3.pdf (http://www.sjsu.edu/senate/docs/S12-3.pdf).

Grading Information

Course weightings will be as follows:

- 20% Programming Assignments
- 20% First In-semester exam (Midterm #1)
- 20% Second In-semester exam (Midterm #2)
- 40% Final Exam

Final grades may be curved (up) to raise grades if needed.

Your course grade will be determined by your final weighted average:
A plus = 97% or higher
A = 93% to 97%
A minus = 90% to 93%
B plus = 87% to 90%
B = 83% to 87%
B minus = 80% to 83%
C plus = 77% to 80%
C = 73% to 77%
C minus = 70% to 73%
D plus = 67% to 70%
D = 63% to 67%
D minus = 60% to 63%
F = 0% to 60%
Boundary cases count as the higher of the two grades.

University Policies

Per University Policy S16-9 (PDF) (http://www.sjsu.edu/senate/docs/S16-9.pdf), relevant university policy concerning all courses, such as student responsibilities, academic integrity, accommodations, dropping and adding, consent for recording of class, etc. and available student services (e.g. learning assistance, counseling, and other resources) are listed on the Syllabus Information (https://www.sjsu.edu/curriculum/courses/syllabus-info.php) web page. Make sure to visit this page to review and be aware of these university policies and resources.

Course Schedule

Here's a breakdown of the course, lecture-by-lecture.

Note: This is a tentative schedule and is subject to change but with fair notice.

Week	Class Dates	Topics
1	Jan 24	Syllabus, etc.
2	Jan 29	Introduction
2	Jan 31	Review (Recursion, Lists, Stacks, Queues)
3	Feb 5	Loop Invariants, Quicksort
3	Feb 7	Asymptotic Growth
4	Feb 12	Recurrence Relations
4	Feb 14	Master Theorem
5	Feb 19	Heaps and Heapsort
5	Feb 21	Quicksort, Quickselect
6	Feb 26	Sorting Lower Bounds
6	Feb 28	Linear Time Sorts (Counting, Bucket, Radix)
7	March 4	Balanced Search Trees
7	March 6	Balanced Search Trees
8	March 11	Review
8	March 13	Exam (Midterm #1)
9	March 18	Graph Introduction (Representation, BFS, DFS)
9	March 20	Topological Sort, Strongly Connected Components
10	March 25	MSTs (Minimum Spanning Trees)
10	March 27	Disjoint Sets
10.5	April 1-5	Spring Break – no classes
11	April 8	Shortest Paths
11	April 10	Shortest Paths
12	April 15	Dynamic Programming
12	April 17	Dynamic Programming
13	April 22	Floyd-Warshall
13	April 24	NP
14	April 29	NP

Week	Class Dates	Topics
14	May 1	Review
15	May 6	More Review
15	May 8	Exam (Midterm #2)
16	May 13	Review
Final Exam	May 15 5:15 PM	DH450 Wednesday May 15, 5:15 PM – 7:30 PM