San José State University
College of Science, Department of Computer Science
CS 146, Data Structures and Algorithms, Section 10, Fall 2023

Course and Contact Information

Instructor: Doug Case
Office Location: MH 225 (MacQuarrie Hall)
Telephone: Please use email instead
Email: doug.case@sjsu.edu
Office Hours: Monday and Wednesday 7:15 PM – 7:45 PM (after class in MH225). Also by appointment.
Class Days/Time: Monday and Wednesday 6:00 PM - 7:15 PM
Classroom: MH 225
Prerequisites: 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, or instructor consent.

Course Description

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.

Course Format

Technology Intensive, Hybrid, and Online Courses

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).

Faculty Web Page and MYSJSU Messaging

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on *Canvas Learning Management System course login website*. You are responsible for regularly checking with the messaging system through *MySJSU* on *Spartan App Portal* (or other communication system as indicated by the instructor) to learn of any updates.

Course Goal

To examine various ways to represent data used by programs and to compare these representations in terms of their memory requirements and the resulting program execution times.

Course Learning Outcomes (CLO)

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

1. Implement lists, stacks, queues, search trees, heaps, union-find ADT (Abstract Data Type), and graphs and 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 (radix sort, 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. 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.
8. Comprehend algorithms designed using greedy, divide-and-conquer, and dynamic programming techniques.
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Texts/Readings

Textbook

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

Other technology requirements / equipment / material

You will need a wireless laptop with internet access.

Library Liaison

Anamika Megwalu, email: *anamika.megwalu@sjsu.edu*, website: https://libguides.sjsu.edu

Course Requirements and Assignments

- Reading Assignments: You will be assigned readings from the textbook or handouts.
- Videos: Videos maybe be posted to introduce new topics not covered in class.
- Online Quizzes: These will just be used to test your own feedback on reading and video assignments. They do not count towards your grade, they are just a tool for you to get feedback on your understanding of the material.
- In Class Discussions, Activities, and Exercises: We will use class time to answer questions, gain intuition about topics covered in readings or videos, and to see how the material covered there can be used to solve other problems.

- Programming Assignments: Programming assignments are to be done individually, unless otherwise specified. They can be discussed but should be implemented individually. More information is given at the time of the first programming assignment. Never use any code you find on the web, unless I provide it. Some assignments have an oral discussion or examination.
- In-semester Exams: there will be two exams during the semester.
- Final Exam: The final exam will be comprehensive for the semester.

University Policy S16-9 (http://www.sjsu.edu/senate/docs/S16-9.pdf) states that:
Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally three hours per unit per week) for instruction, preparation/studying, or course related activities, including but not limited to internships, labs, and clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus.

Grading Information

Course weightings will be as follows:
- 20% Programming Assignments
- 20% In-semester Exam (each)
- 40% Final Exam

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

Your course grade will be determined by your final weighted average:
A plus = 97% or higher
A = 93% up 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.

All students have the right, within a reasonable time, to know their academic scores, to review their grade-dependent work, and to be provided with explanations for the determination of their course grades.
See University Policy S20-2 for more details.

Classroom Protocol

- Do NOT share any course material publicly (on Canvas, GitHub, etc.) without permission, including but not limited to lecture notes, lecture videos, passwords, homework/exam solutions, and class meeting links.

University Policies

Per University Policy S16-9, 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 Syllabus Information web page (https://www.sjsu.edu/curriculum/courses/syllabus-info.php). Make sure to visit this page to review and be aware of these university policies and resources.

CS 146: Data Structures and Algorithms, Fall 2023, Course Schedule

Course Schedule (Subject to change with fair notice, which will be posted in Canvas)

Week	Class Dates	Topics
1	Aug 21, 23	Introduction
2	Aug 28	Review (Recursion, Lists, Stacks, Queues)
2	Aug 30	Loop Invariants
3	LABOR DAY	NO CLASS
3	Sept 6	Asymptotic Growth
4	Sept 11	Recurrence Relations
4	Sept 13	Master Theorem
5	Sept 18	Heaps and Heapsort
5	Sept 20	Quicksort, Quickselect, and Mergesort
6	Sept 25	Sorting Lower Bounds
6	Sept 27	Linear Time Sorts (Counting, Bucket, Radix)
7	Oct 2	Balanced Search Trees
7	Oct 4	Balanced Search Trees
8	Oct 9	Review
8	Oct 11	Exam
9	Oct 16	Graph Introduction (Representation, BFS, DFS)

Week	Class Dates	Topics
9	Oct 18	Topological Sort, Strongly Connected Components
10	Oct 23	MSTs (Minimum Spanning Trees)
10	Oct 25	Disjoint Sets
11	Oct 30	Shortest Paths
11	Nov 1	Shortest Paths
12	Nov 6	Dynamic Programming
12	Nov 8	Dynamic Programming
13	Nov 13	Floyd-Warshall
13	Nov 15	NP
14	Nov 20	NP
14	THANKSGIVING EVE	NO CLASS
15	Nov 28	NP
15	Nov 30	Review
16	Dec 4	Exam
16	Dec 6	Review
Final Exam	Dec 11 5:15 PM	MH225 Monday December 11, 5:15 PM – 7:30 PM