San José State University
College of Science, Department of Computer Science
CS 146 (Sections 10 & 12), Data Structures and Algorithms, Spring 2025

Course and Contact Information

Instructor(s): Maryam Khazaei
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Office Hours: Fridays: 9 a.m-10 a.m - Duncan Hall, room 439

Class Days/Time/Location:
Section 10: Mondays/Wednesdays, 12 p.m –1:15 p.m, Duncan Hall, Room 416
Section 12: Mondays/Wednesdays, 1:30 p.m – 2:45 p.m, Science Building, Room 311

Class Format: In-person

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.

Exam time/Location:
Section 10: **Tuesday, May 20, 10:45 AM-12:45 PM**, Duncan Hall, Room 416
Section 12: **Thursday, May 15, 1:00-3:00 PM**, Science Building, Room 311

Course Description

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

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* (or other communication system as indicated by the instructor) to learn of any updates.

Course Goal

- To ensure students are familiar with implementing elementary data structures and their related algorithms.
- To introduce students to the implementation of more complex data structures.
- To provide students with knowledge of sorting techniques such as heapsort, mergesort, and quicksort.
- To introduce students to various techniques for designing algorithms.

- To educate students on how to assess and determine the time complexity of algorithms.

Course Learning Outcomes (CLO)

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

- Understand the implementation of lists, stacks, queues, search trees, heaps, 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, merge sort, 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.
- 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.
- Understand 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 requirements / equipment

You will need a laptop with internet access.

Library Liaison

website: https://libguides.sjsu.edu

Course Requirements and Assignments

- **Reading Assignments:** The assignments will be from textbook readings and will be posted at the end of the lecture slides.
- **Class Discussions:** To foster critical thinking and engagement, class time will include opportunities for discussion. During lecture, students will be presented with thought-provoking questions related to the day's material. These discussions aim to solidify understanding of key concepts and to encourage students to apply their knowledge in different contexts.
- **Assignments:** There will be programming and non-programming assignments. Assignments may be discussed with peers, but must be completed individually, unless otherwise specified. Students must not use code they find on the web, unless provided as course material.
- **In-semester Exams:** There will be two exams during the semester.
- **Final Exam:** The final exam time is listed below on the course schedule and comprehensively covers course material.

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:

- 25% Assignments (programming and non-programming)
- 5% Participation
- 20% Midterm 1
- 20% Midterm 2
- 30% Final Exam

Exams may be curved up based on student performance.

Course grades 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

- Students must not share any course material publicly (on Canvas, GitHub, etc.) without Instructor permission, including but not limited to lecture notes, 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.

Academic Dishonesty Statement:

University policy F69-24 at http://www.sjsu.edu/senate/docs/F69-24.pdf states that students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to ensure maximum benefit for all members of the class. Attendance shall not be used as a criterion for grading. However, attendance will be required in order to complete and submit in-class exercises, quizzes, and exams.

It is the aim of the faculty of SJSU to foster a spirit of complete honesty and a high standard of integrity. The University Academic Integrity Policy S07-2 at http://www.sjsu.edu/senate/docs/S07-2.pdf requires you to be honest in all your academic coursework. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The attempt of students to present as their own any work that they have not honestly performed will be considered a violation. During examinations, you must do your own work. Talking or discussion is not permitted during the examinations, nor may you compare papers, copy from others, or collaborate in any way. Any collaborative behavior during the examinations will result in failure of the exam and may lead to failure of the course and University disciplinary action.

Disability Accommodations:

If you require course adaptations or accommodations due to a disability, or if you need special arrangements in case of building evacuation, please schedule an appointment with me as soon as possible or visit me during office hours. Presidential Directive 97-03 mandates that students with disabilities register with the AEC to establish a record of their disability. Although students are not legally required to disclose the nature of their disability to faculty, they need to disclose their AEC registration if they will be utilizing course accommodations. Students are responsible for providing documentation that supports their learning disability diagnosis and justifies requested accommodations. If you have any specific questions or need further assistance, feel free to reach out to the AEC staff at aec-info@sjsu.edu or call (408) 924-6000 during regular business hours.

Classroom Heat Advisory Protocol:

In the event of a heat advisory impacting the Science building (such as SCI 311), this class may be transitioned to a remote format to ensure student comfort and safety. If a heat event occurs, you will be notified in advance regarding any changes to the class format or location. Please check your email and course announcements for updates.

CS 146: Data Structures and Algorithms, Fall 2024, Course Schedule

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

Week	Date	Topics
1	M 1/27	Introduction: Syllabus, Course Logistics
1	W 1/29	Introductory topics (Running time analysis) - Insertion Sort, Growth of Functions
2	M 2/3	Divide and Conquer technique: Merge Sort, The Recursion Tree Method
2	W 2/5	The Recursion Tree Method - Master Theorem

3	M 2/10	Heaps and Heapsort
3	W 2/12	Priority Queues-Linear Time Sort, Counting sort
4	M 2/17	Bucket Sort, Quicksort
4	W 2/19	Review for midterm 1
5	M 2/24 W 2/26	No class due to conference travel
6	M 3/3	Midterm 1
6	W 3/5	Binary Search Trees
7	M 3/10	Binary Search Trees / Hash Tables
7	W 3/12	Hash Tables / Red-Black trees
8	M 3/17	Red-Black trees
8	W 3/19	Dynamic Programming
9	M 3/24	Dynamic Programming
9	W 3/26	Greedy Algorithms
10	M 3/31 W 4/2	Spring break
11	M 4/7	Midterm 2
11	W 4/9	Graph Introduction (Representation, BFS, DFS)
12	M 4/14	Directed graph, Topological Sort, Strongly Connected Components
12	W 4/16	Minimum Spanning Tree – Prim's and Kruskal's Algorithm
13	M 4/21	Shortest Paths: Bellman-Ford Algorithm, Dijkstra's Algorithm
13	W 4/23	Continued Shortest Paths
14	M 4/28	NP-complete problems
14	W 4/30	NP-complete problems
15	M 5/5	Guest speaker – workshop (internship & job search)
15	W 5/7	Review for Final
16	M 5/12	Review for Final
Final Exam	M 5/19, 20	**Section 10: Tuesday, May 20, 10:45 AM-12:45 PM**, Duncan Hall, Room 416 **Section 12: Thursday, May 15, 1:00-3:00 PM**, Science Building, Room 311