SJSU SAN JOSÉ STATE UNIVERSITY

College of Science · Computer Science

Data Structures and Algorithms Section 03

CS 146

Spring 2025 In Person 3 Unit(s) 01/23/2025 to 05/12/2025 Modified 01/31/2025

Contact Information

Instructor: Dr Nada Attar

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Office Hours

Monday, 2:45 PM to 3:45 PM, MH218 (In Person)

Tuesday, 2:45 PM to 3:45 PM, Zoom

https://sjsu.zoom.us/j/83923495067?pwd=mAsZRNPbkh3Y9dG8FP7dPdpqSTzK9x.1 (https://www.google.com/url?q=https://sjsu.zoom.us/j/83923495067?pwd%3DmAsZRNPbkh3Y9dG8FP7dPdpqSTzK9x.1&sa=D&source=calendar&ust=1738247794320926&usg=AOvVaw0EbV3cJNGbEypTg2hDcaeh)

Course Information

Lecture (In Person)

Monday, Wednesday, 1:30 PM to 2:45 PM, MH222

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

- The lectures for this course will be conducted in person. Regular class attendance is highly recommended and strongly encouraged.
- This section includes one online office hour and one in-person office hour each week. During online office hours, please ensure your camera is turned on, if possible.
- Do not publicly share or upload any course materials, such as exam questions, lecture notes, or solutions, without the instructor's consent. Sharing course materials without permission is strictly prohibited.
- Grade disputes must be submitted within one week of the grade being posted.
- All electronic communication with the instructor should be conducted through Canvas. Messages should be sent via Canvas, and the instructor will check messages only during working hours (8:00 AM–4:00 PM) from Monday to Friday. Messages sent outside working hours, on weekends, or during holidays will be addressed on the next official business day.

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 Goals

1. To ensure that students are familiar with ways to implement elementary data structures and their associated algorithms.
2. To introduce students to the implementation of more complex data structures and their associated algorithms.
3. To acquaint students with advanced sorting techniques.
4. To teach students how to determine the time complexity of algorithms.
5. To introduce students to algorithm design techniques.

Course Learning Outcomes (CLOs)

Upon successful completion of this course, students should 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

Course Materials

Introduction to Algorithms

Author: Cormen, Leiserson, Rivest, and Stein
Publisher: MIT Press, 2009
Edition: 3rd Edition
ISBN: ISBN-10: 0262033844ISBN-13: 978-0262033848

You can find errata (bug reports) for the book http://www.cs.dartmouth.edu/~thc/clrs-bugs/bugs-3e.php,for whichever printing of the book you get

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 S12-3at http://www.sjsu.edu/senate/docs/S12-3.pdf.
- Homework assignments will be individual, regularly assigned, will include written problem assignments, and perhaps some online exercises. The homework is a tool for you to learn the material and prepare you for the exams.
- Any work for this class must be completed independently. If you use a tutor, receive help from a friend, or utilize an AI tool, you must clearly acknowledge this in your submission and provide a detailed explanation of how the assistance was used.
- Late Submission for homework assignment:
  - 0-6hr -> no penalty
  - +6hr -> 50% penalty
  - +12hr -> 100% penalty

Grading Information

Criteria

Your grade for the course will be based on the following components:

Type	Weight	Topic	Notes
Assignments	20%		
Lab and Class Activities	10 %		
Quizzes	20 %		
Exam 1	15 %		
Exam 2	15 %		
Final Exam	20 %		

Breakdown

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

When	Topic	Notes
Lecture 01/27/2025 1:30 PM - 2:45 PM	Introduction: syllabus, Course mechanic & Logistics; Review Data Structures (lists, stacks, queues, trees)	
Lecture 01/29/2025 1:30 PM - 2:45 PM	Basic algorithms, Insertion sort ; Growth of functions- O, Ω, Θ, o, ω	
Lecture 02/03/2025 1:30 PM - 2:45 PM	Divide and Conquer technique: Merge Sort, other examples	

When	Topic	Notes
Lecture 02/05/2025 1:30 PM - 2:45 PM	Solving recurrences	
Lecture 02/10/2025 1:30 PM - 2:45 PM	Master Theorem	
Lecture 02/12/2025 1:30 PM - 2:45 PM	Heapsort, Priority Queues	
Lecture 02/17/2025 1:30 PM - 2:45 PM	Sorting in linear time	
Lecture 02/19/2025 1:30 PM - 2:45 PM	Counting sort, Radix Sort	
Exam 1 02/24/2025 1:30 PM - 2:45 PM		
Lecture 02/26/2025 1:30 PM - 2:45 PM	Hash Tables	
Lecture 03/03/2025 1:30 PM - 2:45 PM	Quicksort	
Lecture 03/05/2025 1:30 PM - 2:45 PM	Binary Search Trees	

When	Topic	Notes
Lecture 03/10/2025 1:30 PM - 2:45 PM	Red-Black trees	
Lecture 03/12/2025 1:30 PM - 2:45 PM	2-3 Trees	
Lecture 03/17/2025 1:30 PM - 2:45 PM	Dynamic Programming	
Lecture 03/19/2025 1:30 PM - 2:45 PM	Dynamic Programming	
Lecture 03/24/2025 1:30 PM - 2:45 PM	Elementary Graph Algorithms, Undirected graph	
Lecture 03/26/2025 1:30 PM - 2:45 PM	BFS, DFS	
Holiday 03/31/2025 1:30 PM - 2:45 PM	Spring Break	
Holiday 04/02/2025 1:30 PM - 2:45 PM	Spring Break	
Lecture 04/07/2025 1:30 PM - 2:45 PM	BFS, DFS	

When	Topic	Notes
Exam 2 04/09/2025 1:30 PM - 2:45 PM		
Lecture 04/14/2025 1:30 PM - 2:45 PM	Directed graph, Topological Sort	
Lecture 04/16/2025 1:30 PM - 2:45 PM	Strongly connected components	
Lecture 04/21/2025 1:30 PM - 2:45 PM	Review	
Lecture 04/23/2025 1:30 PM - 2:45 PM	Review	
Lecture 04/28/2025 1:30 PM - 2:45 PM	Minimum Spanning Tree – Prim's and Kruskal's Algorithm	
Lecture 05/05/2025 1:30 PM - 2:45 PM	Single Source Shortest Paths: Dijkstra's Algorithm	
Lecture 05/07/2025 1:30 PM - 2:45 PM	NP-complete problems	
Final Exam		Monday, May 19 | 1:00-3:00 PM