San José State University
College of Science
Department of Compute Science

CS 146-S5 Data Structures and Algorithms

Fall 2021

Instructor(s):	Dr. Chung-Wen (Albert) Tsao
Email:	chung-wen.tsao@sjsu.edu (Once the class starts, please use Canvas Inbox)
Class Days/Time:	T/TR 2:15-3:30 am
Classroom:	Online only-Synchronous: https://sjsu.zoom.us/j/85242844965
Office Hours:	• M/W: 17:20 - 18:00PM https://sjsu.zoom.us/j/86795567911 • T/R : 17:20 - 18:00PM https://sjsu.zoom.us/j/88010610862 By Appointments
Prerequisites:	• Math 030 Calculus I, • Math 042 Discrete Mathematics, • CS 049J Programming in Java or equivalent knowledge of Java, • CS 046B Introduction to Data Structures
Class Meeting Dates:	Aug 19, 2021- Dec 6, 2021
Units	3 units

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

LockDown Browser + Webcam Requirement

This course requires the use of LockDown Browser and a webcam for online quizzes. The webcam can be the type that's built into your computer or one that plugs in with a USB cable. Watch this brief video to get a basic understanding of LockDown browser and the webcam feature. Download and install LockDown browser from here.

Faculty Web Page and MYSJSU Messaging

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on MySJSU Canvas. You are responsible for regularly checking with the email system through MySJSU at http://my.sjsu.edu to learn of any updates.

Course Learning Outcomes (CLO) :

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

- Analyze the running time of algorithms using asymptotic notation

- Implement search trees, heaps, and graphs and use these data structures in programs they design
- Perform breadth-first search and depth-first search
- Use advanced sorting techniques
- 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

Required Text:

Cormen, Leiserson, Rivest and Stein, Introduction to Algorithms, 3rd Edition , ISBN-10: 0262033844, ISBN-13: 978-0262033848, MIT Press, 2009
You can find errata (bug reports) for the book http://www.cs.dartmouth.edu/~thc/clrs-bugs/bugs-3e.php.

Assignments:

- **Late assignments will NOT be accepted for any reason.**
- All homework must clearly indicate each student's name, course, and assignment number.
- Students are allowed (and actively encouraged) to form study groups.
- You may discuss solutions but you MUST write up the answers independently.
- If you use a website or reference book, you must cite it.
- If there are multiple similar submissions not exhibiting independent thought, or with words obviously lifted from a book or website, ALL such submissions will receive scores of 0.

Pop Quizzes:

Pop quizzes locked with passcode may be given anytime during class. They are usually explained in class and due on the end of the lecture day. The purpose of pop quizzes is to encourage you to study and review the concepts and materials we discussed in the lecture.

Midterm and Final Examinations

- There will be two midterm examinations, and a cumulative final exam
- Exams typically include an in-class closed-book quiz and a take-home open-book written test.
- Exams may NOT be taken before or after the scheduled time for any reason. All the students need to attend synchronously.
- No make-up exams for anyone except for the medical emergency with the official medical proof.
- Use of electronic devices during exams is NOT allowed unless stated otherwise.
- All exams include quizzes (closed book) and written test (open book)
- All exams will remain with the instructor.

Grading:

The final grade in the course will be calculated based on the following percentages:

• pop quizzes	(10%)
• homework+programming	(35%),
• midterm exam 1	(15%),
• midterm exam 2	(15%),
• final exam	(25%)

The grading scale is as follows:
Final grades will not be adjusted in any way - so an 89.99% is still a B+.
No incomplete grades will be given.

Grading Scale					
A+	≥ 97%	A	93%	A-	90%
B+	87%	B	83%	B-	80%
C+	77%	C	73%	C-	70%
D+	67%	D	63%	D-	60%
F	below 60.0%				

Classroom Protocol and Other Notes

- **Absences in attending the first two lectures will be dropped out from the class.**
- **No late assignments will be accepted without advanced arrangement with the instructor.**
- Do not ask for special treatment. The rules for this course apply to everyone equally.
- Cheating will not be tolerable; a ZERO will be given to any cheated assignment/exams, and it will be reported to the Department and the University.
- Do NOT share/post online any course materials, PPT slides, or homework solutions.
- Use of electronic devices during exams is NOT allowed unless stated otherwise.
- You are required to check Canvas for reading/assignments.
- The information on this syllabus is subject to change; changes, if any, will be clearly explained in class, and it is your responsibility to become aware of them.
- Once the class starts, use Canvas Inbox to email me for a faster response. I check the Canvas Inbox emails much more often than my school emails.

Attendance

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 insure maximum benefit for all members of the class.

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 at http://www.sjsu.edu/gup/syllabusinfo/" Make sure to review these policies and resources.

Course Schedule (This schedule is subject to change with fair notice.)

Week	Date	Topics	Readings
1	19-Aug	Introduction, administration, time and space complexity	
2	24-Aug	Growth of Functions, asymptotic notation O, Ω, Θ, o, ω (Ch 3)	
	26-Aug	Recurrences (Merge Sort)	4.1

3	31-Aug	Recurrences, master theorem	4.3, 6.1-6.2
	2-Sep	Sorting: intro to heapsort	7.1-7.3
4	7-Sep	Sorting: heapsort, priority queues	7.4
	9-Sep	Sorting: quicksort	5.1-5.3
5	14-Sep	Sorting: quicksort average case analysis	5.4
	16-Sep	Linear time sorting algorithms: Counting Sort, Radix Sort	(Ch 8)
6	21-Sep	Order statistics: selection in expected linear time	8.3-8.4 9.1-9.2
	23-Sep	Order statistics: selection in worst-case linear time	9.3
7	28-Sep	Midterm 1	
	30-Sep	Structures: binary search trees	12.1-12.3
8	5-Oct	Structures: red-black trees	13.1-13.2
	7-Oct	Structures: red-black trees (insertion)	
9	12-Oct	Structures: hash tables (hash functions)	
	14-Oct	Structures: hash tables (universal hashing)	
10	19-Oct	Graph algorithms: the basics	22.1-22.3
	21-Oct	Graph algorithms: DFS/BFS	22.1 23.3
11	26-Oct	Minimum spanning trees, Prim's, Kruskal's, Disjoint sets	21.1-21.3
		Shortest paths: DAG, Dijkstra's algorithm Bellman-Ford	24.1-24.3
12	2-Nov	Dynamic programming	15.1, 15.3
	4-Nov	Dynamic programming, Bellman-Ford	23.2
13	9-Nov	Midterm 2	
	11-Nov	Veteran’s Day - Campus Closed	
14	16-Nov	Dynamic programming (longest common subsequence)	15.4
	18-Nov	Dynamic programming (knapsack, Floyd-Warshall	
15	23-Nov	Greedy algorithms	16.1-16.2
	25-Nov	Thanksgivings	
16	30-Nov	NP-Completeness	34.1-34.2
	2-Dec	NP-Completeness: reductions	34.3-4

Final Exam	10-Dec	Friday, 12:15–2:30 PM	

SJSU ACADEMIC YEAR CALENDAR 2021/22