San José State University
College of Science / Department of Computer Science
Data Structures and Algorithms, CS146-06, Fall 2020

Course and Contact Information (Synchronous Online Course)

Instructor:	Dr. Mike Wu
Office Location:	MacQuarrie Hall 211(Online)
Email:	Ching-seh.Wu@sjsu.edu
Office Hours:	Tuesday & Thursday 1:30 -2:30 pm **(Please drop me an email with time info and subject.)**
Class Days/Time:	Tuesday and Thursday 6:00pm ~ 7:00pm
Class Room:	Online
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

Faculty Web Page and MYSJSU Messaging

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

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 techniques.

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 Texts/Readings

Textbook

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.

Course Requirements and Assignments

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, and so on.

Assignments

You are expected to learn all of the material presented in the lectures. Assignments include written and programming and must be done individually. Assignments must be turned in on time; **late submission will NOT be accepted** with the exception of medical emergencies or similar exceptional circumstances that must be discussed in advance with the instructor. All written assignments are due at the beginning of the class period on the announced due date. Programming assignments must be written in Java. More information regarding requirements and submission format will be given at the time of each programming assignment. Never use any codes you find on the web or given by someone else. Plagiarism Detection tools and similar codes checking software will be used to check programming cheating behavior. You will be asked to set up appointments with me to demo and explain your code.

Pop Quizzes & Pop Questions

Unannounced pop questions and pop quizzes may be given anytime during class. The purpose of pop questions and pop quizzes is to encourage you to learn, study and review the concepts and materials presented/discussed in the lecture. These will generally be problems covered in the today's or previous lecture. You will be called to answer pop questions anytime during the online lecture. If your name is called and no response or you give incorrect answers, 0 points will be recorded. There will be proximately 8-10 pop quizzes during the semester. Each pop quiz will be scored/weighted evenly. In the end of semester, the top 80% of your pop quizzes will be selected for calculating your final score of your pop quizzes. In other words, you can drop the bottom 20% of your pop quizzes. However, **if you miss a class and miss a pop quiz, it counts 0 point and it cannot be dropped.** Each missing pop quiz is scored as 0 point and must be used to calculate your final score.

Midterms and Final Exams

Exams will consist of questions and problems aimed at assessing student mastery of course topics. Conceptual questions may be in the form of essay or multiple-choice format and questions that require pseudo code and/or computations. All exams are closed book and note. If you are unable to attend any one of the exams, arrangements may be made only if you have a legitimate reason. You need to inform your instructor ahead of time and have written documentation available. If you are unable to attend the exam due to illness or emergency, you also need to inform your instructor before the exam and bring documentation afterwards to request a make-up exam, or the points for that exam will be allocated to other exams.

Grading Information

Determination of Grades

The components of the final grade will be distributed as follows:

- **Class Participation: 15%** (pop quizzes, pop questions, discussions during the online lectures, etc.)

- **HW & Programming Assignments: 30%** (3 written worth 4% each, 3 programming worth 6% each)
- **Midterm exams: 35%** (2 midterm exams)
- **Final exam: 20%** (Accumulative/Comprehensive)

Digit number grades will be assigned according to the following policy:

97 ~ 100 ---- A+
93 ~ 96 ---- A
90 ~ 92 ---- A-
87 ~ 89 ---- B+
83 ~ 86 ---- B
80 ~ 82 ---- B-
77 ~ 79 ---- C+
73 ~ 76 ---- C
70 ~ 72 ---- C-
67 ~ 69 ---- D+
63 ~ 66 ---- D
60 ~ 62 ---- D-
0 ~ 59 ---- F

- Each assignment and exam will be scored (given points) but not assigned a letter grade. Final individual class letter grades will be assigned based on the class curve. Your final class grade can be adjusted up or down depending on your level and quality of class performance.
- **Zero-Tolerance on plagiarism: any types of cheating will not be tolerable; a final course grade 'F' will be given and will be reported to the Department and the University. Sharing your homework solutions with any other students will be treated as cheating.**

Zoom Class Protocol and Other Notes

- **This course is a synchronous online course very much like in-person class.**
- **Absences in attending anyone of the first two lectures will be instructor-dropped out from the class.**
- Students are required to have an electronic device (laptop, desktop or tablet) with a camera and built-in microphone. Students are responsible for ensuring that they have access to reliable Wi-Fi during tests. If students are unable to have reliable Wi-Fi, they must inform the instructor, as soon as possible.
- Even though this is an online course, every student must attend class and participate actively. Participation doesn't mean that you just log into your Zoom class. You must sit in the front of your computer (**no cell phone**) in a private and strong internet connection environment without other people's interference.
- All pop quizzes and exams will be proctored in this course through Respondus Monitor (with eye-tracking) and LockDown Browser. A webcam during exams is required. Please note it is the instructor's discretion to determine the method of proctoring. If cheating is suspected the proctored videos may be used for further inspection and may become part of the student's disciplinary record. Note that the proctoring software does not determine whether academic misconduct occurred, but does determine whether something irregular occurred that may require further investigation. Students are encouraged to contact the instructor if unexpected interruptions (from a parent or roommate, for example) occur during an exam.
- There will be no Zoom lecture recordings for later review/study. Recording a lecture is prohibited. Students are prohibited from recording class activities (including class lectures, office hours, advising sessions, etc.), distributing class recordings, or posting class recordings. Materials created by the instructor for the course (syllabi, lectures and lecture notes, presentations, etc.) are copyrighted by the

instructor. This university policy (S12-7) is in place to protect the privacy of students in the course, as well as to maintain academic integrity through reducing the instances of cheating. Students who record, distribute, or post these materials will be referred to the Student Conduct and Ethical Development office. Unauthorized recording may violate university and state law. It is the responsibility of students that require special accommodations or assistive technology due to a disability to notify the instructor.

- You will be called in most class sessions for pop questions and to discuss material contained in lectures by using Random Roster Checker.
- **When emailing me, please always start your email subject line with "CS146-S6: XXXXX" to get my attention. (S6: Section number, XXXXX: Subject, for example: CS146-S6:HW1 Question)**
- **Plagiarism/Cheating will not be tolerable: 'F' will be given to your FINAL COURSE GRADE and will be reported to the Department and the University. (please be noted: obtaining HW solutions from someone or giving/showing your HW solutions to someone is also treated as plagiarism/cheating.)**
- **Attendance is crucial to doing well on pop quizzes, assignments and examinations.**
- **Students are responsible for all materials distributed on Canvas and discussed in the class.**

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.

Consent for Recording of Class and Public Sharing of Instructor Material: University Policy S12-7, http://www.sjsu.edu/senate/docs/S12-7.pdf, requires students to obtain instructor's permission to record the course: Common courtesy and professional behavior dictate that you notify someone when you are recording him/her. You **must** obtain the instructor's permission to make audio or video recordings in this class. Such permission allows the recordings to be used for your private, study purposes only. The recordings are the intellectual property of the instructor; you have not been given any rights to reproduce or distribute the material. Course material cannot be shared publicly without his/her approval. **You are not allowed to publicly share or upload instructor generated material for this course such as exam questions, lecture notes, or homework solutions without instructor consent.**

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.

Data Structures and Algorithms, CS146-S6, Fall 2020, Course Schedule

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

Week	Date	Topics, Readings, Assignments, Deadlines
1	08/20	Motivation, Orientation /Syllabus, Prerequisites Check, Introduction: Algorithms & Computers (Ch 1 & Appendix A) (Student Information Due)
1	08/25	Review Data Structures (lists, stacks, queues, trees), recursion, basic algorithms (Ch 10)
2	08/27	Growth of functions- O, Ω, Θ, o, ω (Ch 3)
2	09/01	Growth of functions- O, Ω, Θ, o, ω (Ch 3)

Week	Date	Topics, Readings, Assignments, Deadlines
		Insertion Sort (Ch 2.1)
3	09/03	Divide and Conquer technique: Merge Sort
3	09/08	Solving recurrences - Master Theorem (Ch 4.3-4.5)
4	09/10	Master Theorem - Intro to Heaps (Ch 6.1)
4	09/15	Heapsort, Priority Queues (Ch 6)
5	09/17	Quicksort (Ch 7)
5	09/22	Analysis of Quicksort (Ch 7)
6	09/24	**Midterm 1**
6	09/29	Sorting in linear time, Counting sort, Radix Sort, (Ch 8)
7	10/01	Order statistics - Selection Algorithm (Ch 9)
7	10/06	Hashing (Ch 11)
8	10/08	Union Find, Dynamic sets, Binary Search Trees (Ch 12)
8	10/13	Red Black trees (Ch 13)
9	10/15	B-trees (Ch 18)
9	10/20	Greedy technique (Ch 16)
10	10/22	Dynamic Programming technique (Ch 15)
10	10/27	Graphs (Appendix B.1, B.4-5)
11	10/29	**Midterm 2**
11	11/03	BFS (Ch 22.1)
12	11/05	DFS (Ch 22.2)
12	11/10	Topological sort (Ch 22.3-5)
13	11/12	Minimum Spanning Tree – Prim's and Kruskal's Algorithm, Data Structures for Disjoint Sets (Ch 23, Ch 21)
13	11/17	Single Source Shortest Paths: Dijkstra's Algorithm (Ch 24)
14	11/19	All-Pairs Shortest Paths: Floyd-Warshall (Ch 25.1-2)
14	11/24	NP-completeness, Reductions (Ch. 34.1-4)
15	11/26	Thanksgiving Holiday – Campus Closed
15	12/01	NP-complete problems (Ch. 34.5)
16	12/03	Review
Final Exam	12/10	Thursday, December 10th, 09:45am~12:00pm (noon)