San José State University
College of Science/Department of Computer Science
CS146, Data Structures and Algorithms, Spring, 2022, Section 3

Course and Contact Information

Instructor:	Nada Attar
Office Location:	MH 218
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Email:	nada.attar@sjsu.edu
Office Hours:	TuTh 7:30-8:30 PM Zoom Link: https://sjsu.zoom.us/j/88275691092 Appointment slots (required for office hours): https://calendar.google.com/calendar/u/0/selfsched?sstoken=UUlPZVdhWkdtZFI4fGRlZmF1bHR8ZmJhMGUzOTQ3YTM5MjIxODRmZTI2YjJjMmE1M2QyNGE
Class Days/Time:	Section 3: TuTh 6:00-7:15 PM Zoom Link: https://sjsu.zoom.us/j/84271007585
Prerequisites:	MATH 42, MATH 30, CS 46B, or CS 49J (or equivalent knowledge of Java) (with a grade of "C-" or better in each); Computer Science, Applied and Computational Math or Software Engineering majors only; or instructor consent
Classroom:	Class is offered completely online with designated day/time meeting pattern

Course Description

Implementations of advanced tree structures, priority queues, heaps, directed and undirected graphs. Advanced searching and sorting (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.

Course Format

Faculty Web Page and MYSJSU Messaging

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on my faculty web page at http://www.sjsu.edu/people/firstname.lastname and/or on Canvas Learning Management System course login website at http://sjsu.instructure.com. You are responsible for regularly checking with the messaging system through MySJSU at http://my.sjsu.edu (or other communication system as indicated by the instructor) to learn of any updates.

Course Objectives

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 (CLO)

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

Required Texts/Readings

Textbook

Recommended reading:

Introduction to Algorithms, 3rd Edition Cormen, Leiserson, Rivest, and Stein
ISBN-10: 0262033844ISBN-13: 978-0262033848MIT Press, 2009
https://www.amazon.com/Introduction-Algorithms-3rd-MIT-Press/dp/0262033844
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.

Programming Language
Java (version 7 or later)

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.

Final Examination:

One final cumulative exam.

The exams will contain multiple choice questions, short answer questions and questions that require pseudocode and/or computations. Students must obtain >50% in quizzes and final exam in order to be eligible for a passing grade.

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

- Exam 1 - 20%
- Exam 2 - 20%
- Final Exam - 20 %
- Assignments - 40 %

Final exam and quizzes are closed book; final exam is comprehensive. No extra point options in the final. No make-ups exams except in case of verifiable emergency circumstances. Any additional rules and regulations can be applied when taking exams to prevent dishonesty and cheating.

Determination of Grades
The following shows the grading scale to be used to determine the letter grade:

Percentage	Grade
95 and above	A+
92-94	A
90 - 91	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-
59 and below	F

Classroom Protocol

The lectures will be on an online mode. Regular class attendance is highly recommended and strongly encouraged. A video for each lecture will be posted after the class. The recorded lectures will be shared only with the students enrolled in the course through Canvas. This section has online office hours, that are in time slot format. The time slot should be reserved before the midnight of the previous day of the office hours. Please have your camera on during office hours. Do not publicly share or upload material for this course such as exam questions, lecture notes, or solutions without my consent.

Students are not allowed to share any of the materials of the course without the instructor's consent.

University Policies

The link below contains university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc.: https://www.sjsu.edu/curriculum/courses/syllabus-info.php

Policies

Late homework/projects

All assignments and projects will be due on Thursday of the indicated week at 6:00pm. The assignment will be posted at least a week before the due date to give enough time to work and ask for help during my virtual office hours. Please do not email me few hours before the deadline asking me to help you understand concepts. If I feel that you just start working on your assignment at the due date, I will ignore your emails because I know you won't be able to finish understanding the problem, coding, testing, compiling, and debugging in a few hours. So, please start early and manage your time wisely.

Late Submission:

- 0-6hr -> no penalty
- +6hr -> 60% penalty
- +12hr -> 100% penalty

If you believe an error was made in the grading of your assignments, quizzes, or final exam, you can request a re-grade from the instructor. A request must be sent to the instructor no more than one week after the grades are posted.

Online Discussion Forum Etiquette

Ask clear questions to get better answers. Make sure your question has not been already asked and answered. Read these guidelines (http://superuser.com/help/how-to-ask) when you ask a question. It is fine to share a couple of lines of code but please don't just post your code or share a significant amount of code. Try to ask general questions.

Course Schedule

Week	Date	Topics, Readings, Assignments, Deadlines
1	Th 1/27	Introduction: syllabus, Course mechanic & Logistics
2	Tu 2/1	Review Data Structures (lists, stacks, queues, trees) (Ch.10)
2	Th 2/3	Basic algorithms, Insertion sort (Ch.1, Ch.2) Growth of functions- O, Ω, Θ, o, ω (Ch.3)
3	Tu 2/8	Divide and Conquer technique: Merge Sort, other examples (Ch.4)
3	Th 2/10	Solving recurrences, Master Theorem (Ch.4)
4	Tu 2/15	Heapsort, Priority Queues (Ch.6)
4	Th 2/17	Sorting in linear time (Ch.8), Counting sort, Radix Sort (Ch.8)
5	Tu 2/22	Hash Tables (Ch.11)
5	Th 2/24	Quicksort, (Ch.7, Ch. 9)
6	Tu 3/1	Review
6	Th 3/3	Exam 1
7	Tu 3/8	Binary Search Trees (Ch.12)
7	Th 3/10	Red-Black trees (Ch.13)
8	Tu 3/15	Red-Black trees (Ch.13)
8	Th 3/17	Dynamic Programming (Ch.15)
9	Tu 3/22	Dynamic Programming (Ch.15)
9	Th 3/24	Greedy Algorithms (Ch.16)
10	Tu 3/29	*No Class - Spring Break*
10	Th 3/31	*No Class - Cesar Chavez Day (Observed) - Campus Closed (CC)*
11	Tu 4/5	Elementary Graph Algorithms, Undirected graph (Ch.22)
11	Th 4/7	BFS, DFS (Ch.22)
12	Tu 4/12	Directed graph, Topological Sort (Ch.22)
12	Th 4/14	Review
13	Tu 4/19	Exam 2
13	Th 4/21	Strongly connected components (Ch.22)
14	Tu 4/26	Minimum Spanning Tree – Prim's and Kruskal's Algorithm (Ch.23)
14	Th 4/28	Minimum Spanning Tree – Prim's and Kruskal's Algorithm (Ch.23)
15	Tu 5/3	Single Source Shortest Paths: Dijkstra's Algorithm (Ch.24)
15	Th 5/5	NP-complete problems (Ch.34)
16	Tu 5/10	NP-complete problems (Ch.34)
16	Th 5/12	Review
17	5/18-5/25	Final Exam Thursday, May 19 (5:15-7:30 PM)