

# CS 146-S9 Data Structures and Algorithms

Class Meeting Dates: 08/21/2019 - 12/09/2019

Time: MW 18:00 - 19:15 PM

Room: SCI 311

Fall 2019

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(Once the class starts, use Canvas Inbox emails.)

Phone: use emails

Office Hours:

M/W 14:00pm – 14:30pm

Or appointments by email

**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 **Units: 3**

**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 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:** The 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>.

**Class attendance:** Attendance is required. Exams and homework will be taken from material covered in lectures.

**Assignments:** There will be at least *eight* assignments in total. A randomly selected subset will be graded for each assignment.

- **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:** Unannounced quizzes may be given anytime during class. The purpose of pop quizzes is to encourage you to study and review the concepts and materials we discussed in the previous lecture. These will generally be problems covered in the previous lecture.

**Exams:** There will be two midterm examinations, and a cumulative final exam. Question types on the midterm and final exams may include multiple-choice, true/false, short-answer, and proof.

- **Exam may NOT be taken before or after the scheduled time for any reason.**
- No make-up exam for anyone with any reason.
- Books, notes, computers, translating devices, and cell phones will not be allowed during exams.
- All exams will remain with the instructor.

**Grading:**

- class participation/Pop Quizzes (5%)
- midterm exam 1 (20%),
- midterm exam 2 (20%),
- assignments (25%),
- final exam (30%)

No extra credit will be assigned. Grades will not be adjusted in any way - so an 89.9% is still a B+. No incomplete grades will be given. The grading scale is as follows:

A 92.5% A- 90.0% B+ 87.5% B 82.5% B- 80.0% C+ 77.5%

C 72.5% C- 70.0% D+ 67.5% D 60.0% F lower than 60%

**Academic Dishonesty:** By enrolling in this class the student agrees to uphold the standards of academic integrity described at <http://www20.csueastbay.edu/academic/academic-policies/academic-dishonesty.html>.

- Although collaborate study and dialogue are encouraged within each study group, "high level" discussion of algorithms is acceptable, but detailed discussion is not. Students are expected to author solutions entirely on their own, and do not share solutions with other groups. Such sharing constitutes academic dishonesty, as described in the CSUEB catalog.
- Finding a solution to the program or assignment online is also not allowed. Any essential code included from sample programs must be properly acknowledged in comments. Any work not your own, e.g., results obtained from reference sources or from other individuals, should receive appropriate bibliographic citations.
- Quizzes and exams are to be individual, not team efforts. Otherwise it is considered plagiarism. Plagiarism is the act of using someone else's words or programming code and claiming them as your own. (Please refer to the CSUEB catalog for a complete description). **Any evidence** of cheating will be pursued to the fullest extent of university policy.
- Any student who is found academically dishonest or plagiarized will receive a 0 on the program, lab, assignment, quiz, or exam, and an academic dishonesty report will be filed. This will occur on the first infraction and will become part of the student's permanent academic record.

**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. No incomplete grades will be given.**
- **No exam may be taken before or after the scheduled time for any reason.**
- **There is no make-up quiz, assignment, project, or midterm/final exam.**
- **No extra credit will be assigned. Grades will not be adjusted in any way.**
- 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.
- Audio or video recording of the lectures are NOT allowed.
- Use of electronic devices during exams is NOT allowed.
- You are required to check Canvas for reading/assignments.

- The information on this syllabus is subject to change; changes, if any, will be carefully 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 email.

### 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 may not 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.

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

Week	Date	Topics, Readings	Assignments
1	8/21	Motivation, Orientation /Syllabus, Introduction: Algorithms & Computers (Ch 1 & Appendix A) .	
2	8/26	Review Data Structures (lists, stacks, queues, trees), recursion, basic algorithms (Ch 10)	HW1 assigned
2	8/28	Growth of functions- $O$ , $\Omega$ , $\Theta$ , $o$ , $\omega$ (Ch 3)	
3	9/4	<b>Labor Day - Campus Closed</b>	HW1 due, HW2 assigned
3	9/6	Insertion Sort, Analyzing and Designing Algorithms (Ch 2)	
4	9/11	Divide and Conquer technique: Merge Sort(Ch 2.2, 2.3)	
4	9/13	Solving Recurrences - Master Theorem (Ch 4.3-4.5)	HW2 due
5	9/18	Master Theorem(Ch 4.3-4.5), Intro to Heaps (Ch 6.1) .	HW3 assigned
5	9/20	Heapsort (Ch 6), Priority Queues (Ch 6)	
6	9/25	Quicksort (Ch 7)	
6	9/27	Analysis of Quicksort (Ch 7)	HW3 due
7	10/2	Sorting in linear time (Ch 8)	HW4 assigned
7	10/4	<b>Midterm 1</b>	
8	10/9	Sorting in linear time, Counting Sort (Ch 8)	
8	10/11	RadixSort, Bucket Sort (Ch 8)	HW4 due
9	10/16	Hashing (Ch 11)	HW5 assigned
9	10/18	Binary Search Trees (Ch 12)	
10	10/23	Binary Search Trees (Ch 12), Red Black trees (Ch 13)	

10	10/25	Red Black trees (Ch 13)	HW5 due
11	10/30	Graph Algorithms (Ch22)	HW6 assigned
11	11/4	BFS (Ch 22.2). DFS (Ch 22.3) Topological sort (Ch 22.4)	
12	11/6	Graph Algorithms (Ch22), BFS (Ch 22.2). DFS (Ch 22.3), Topological sort (Ch 22.4)	
12	11/08	<b>Midterm 2</b>	
13	11/13	<b>Veterans Day - Campus Closed</b>	HW6 due
13	11/15	Dynamic Programming technique (Ch 15)	HW7 assigned
14	11/20	Dynamic Programming technique (Ch 15)	
14	11/22	Greedy technique (Ch 16)	
15	11/27	Minimum Spanning Tree (Ch23)	HW7 due
15	11/29	Single Source Shortest Paths: Dijkstra's Algorithm (Ch 24.3)	HW8 assigned
16	12/04	All-Pairs Shortest Paths: Floyd-Warshall (Ch 25.1-2)	
16	12/06	NP-completeness, Reductions (Ch. 34.1-4)	
17	12/11	NP-complete problems (Ch. 34.5)	HW8 due
Final Exam	12/16	12:00-13:15pm: Monday,0945-1200.	

[SJSU ACADEMIC YEAR CALENDAR 2019/20](#)