

**San José State University**  
**College of Science / Department of Computer Science**  
**Data Structures and Algorithms, CS146-S7, Spring, 2018**

**Course and Contact Information**

<b>Instructor:</b>	Dr. Mike Wu
<b>Office Location:</b>	MacQuarrie Hall 214
<b>Email:</b>	Ching-seh.Wu@sjsu.edu
<b>Office Hours:</b>	Wednesday 1:15PM – 2:15PM Thursday 2:45PM– 3:45PM (Please drop me email in advance with time info and subject)
<b>Class Days/Time:</b>	TuTh 13:30-14:45
<b>Class Room:</b>	MacQuarrie Hall 222
<b>Prerequisites:</b>	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 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

### Assignments

You are expected to learn all of the material presented in the lectures. Assignments include written and programming. 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 assignments are due at the beginning of the class period on the announced due date.

### Mid-Terms 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. Exams may be split into closed book and open-book sections at the instructor's discretion. 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 : 10% (pop quizzes, pop questions discussion, interaction with instructor, etc.)
- Assignments : 30% (3 written worth 4% each, 3 programming worth 6% each)
- Midterm exams: 40% (20% each)
- Final exam: 20%

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

95 – 100	----	A+
85 – 94	----	A
80 -- 84	----	A-
77 -- 79	----	B+
73 -- 76	----	B
70 -- 72	----	B-
67 -- 69	----	C+
63 -- 66	----	C
60 -- 62	----	C-
57 -- 59	----	D+
53 -- 56	----	D
50 -- 52	----	D-
0 -- 49	----	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.

### **Classroom Protocol and Other Notes**

- **Absences in attending the first two lectures will be dropped out from the class.**
- Every student must attend class and participate actively.
- You will be called in most class sessions to discuss material contained in lectures.
- Pop questions will also be given by using Random Roster Checker.
- **Always start your email subject with "CS146" to get my attention.**
- **Cheating** will not be tolerable; a ZERO will be given to any cheated assignment/exam, and will be reported to the Department and the University.
- Your laptop must remain closed (preferably in your backpack and not on your desk)
- To encourage participation from students, **no** recording is allowed.
- Students must be respectful of the instructor and other students. For example: turn off/silence **cell phones and other mobile devices**.
- Attendance is crucial to doing well on assignments and examinations.
- Students are responsible for all materials distributed 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 may not publicly share or upload instructor generated material for this course such as exam questions, lecture notes, or homework solutions without instructor consent.

### **Dropping and Adding**

Students are responsible for understanding the policies and procedures about add/drop, grade forgiveness, etc. Refer to the current semester [Catalog Policies](http://info.sjsu.edu/static/catalog/policies.html) section at <http://info.sjsu.edu/static/catalog/policies.html>. Add/drop deadlines can be found on the current academic year calendars document on the [Academic Calendars webpage](http://www.sjsu.edu/provost/services/academic_calendars/) at [http://www.sjsu.edu/provost/services/academic\\_calendars/](http://www.sjsu.edu/provost/services/academic_calendars/). The [Late Drop Policy](http://www.sjsu.edu/aars/policies/latedrops/policy/) is available at <http://www.sjsu.edu/aars/policies/latedrops/policy/>. Students should be aware of the current deadlines and penalties for dropping classes. Information about the latest changes and news is available at the [Advising Hub](http://www.sjsu.edu/advising/) at <http://www.sjsu.edu/advising/>.

### **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/>

# Data Structures and Algorithms, CS146-S7, Spring 2018, Course Schedule

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

Week	Date	Topics, Readings, Assignments, Deadlines
1	1/25	Motivation, Orientation /Syllabus, Introduction: (Student Information Due)
1	1/30	Algorithms & Computers (Ch 1 & Appendix A)
2	2/1	Review Data Structures (lists, stacks, queues, trees), recursion, basic algorithms (Ch 10)
2	2/6	Growth of functions- $O$ , $\Omega$ , $\Theta$ , $o$ , $\omega$ (Ch 3)
3	2/8	Growth of functions- $O$ , $\Omega$ , $\Theta$ , $o$ , $\omega$ (Ch 3) Insertion Sort (Ch 2.1)
3	2/13	Divide and Conquer technique: Merge Sort & Matrix multiplication (Ch 2.2, 2.3)
4	2/15	Solving recurrences - Master Theorem (Ch 4.3-4.5) <b>HW Assignment 1 (Out)</b>
4	2/20	Master Theorem - Intro to Heaps (Ch 6.1)
5	2/22	Heapsort, Priority Queues (Ch 6) <b>HW Assignment 1 Due</b>
5	2/27	HW Assignment 1 Solutions Priority Queues (Ch 6)
6	3/1	Quicksort (Ch 7) Analysis of Quicksort (Ch 7)
6	3/6	<b>Midterm 1</b>
7	3/8	Midterm 1 solutions <b>Programming Assignment 1 (Out)</b>
7	3/13	Sorting in linear time, Counting sort, Radix Sort (Ch 8)
8	3/15	Sorting in linear time, Counting sort, Radix Sort (Ch 8) <b>Programming Assignment 1 Due</b>
8	3/20	Hashing (Ch 11)
9	3/22	Hashing (Ch 11) <b>HW Assignment 2 (Out)</b>
9	3/27	Spring Recess
10	3/29	Spring Recess
10	4/3	Union Find, Dynamic sets, Binary Search Trees (Ch 12) <b>HW Assignment 2 Due</b>
11	4/5	Binary Search Trees (Ch 12) HW 2 Solutions
11	4/10	<b>Midterm 2</b>
12	4/12	Red Black trees (Ch 13) <b>Programming Assignment 2 (Out)</b>
12	4/17	Red Black trees (Ch 13) B-trees (Ch 18)

Week	Date	Topics, Readings, Assignments, Deadlines
13	4/19	Greedy technique (Ch 16) <b>Programming Assignment 2 (Due)</b>
13	4/24	Dynamic Programming technique (Ch 15)
14	4/26	Graphs (Appendix B.1, B.4-5) <b>HW Assignment 3 (Out)</b>
14	5/1	Topological sort (Ch 22.3-5) Single Source Shortest Paths: Dijkstra's Algorithm (Ch 24)
15	5/3	All-Pairs Shortest Paths: Floyd-Warshall (Ch 25.1-2) <b>HW Assignment 3 Due</b> <b>Programming Assignment 3 (Out)</b>
15	5/8	NP-completeness, Reductions (Ch. 34.1-4)
16	5/10	NP-complete problems (Ch. 34.5) <b>Programming Assignment 3 Due</b>
16	5/15	HW3 solutions and final review
Final Exam	5/16	Wednesday, May 16 1215-1430