CS 146-S7 Data Structures and Algorithms

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

Time: MW 12:00 - 13:15 PM

Room: MH 222

Fall 2019

Dr. Chung-Wen (Albert) Tsao
Office: Duncan Hall room 282   Office Hours:
E-mail:chung-wen.tsao@sjsu.edu   M/W 9:45-10:20am
    (Once the class starts, use Canvas Inbox emails.)   Or appointments by email
Phone: N/A

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%

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 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. 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	Introduction, administration, time and space complexity	
2	8/26	Basics: asymptotic notation 3 .1-3.2	
2	8/28	Basics: recurrences (mergesort) 4.1	HW1 assigned
3	9/4	Labor Day - Campus Closed	
3	9/6	Basics: recurrences continued, master theorem 4.3, 6.1-6.2	
4	9/11	oSrting: intro to heapsort 7.1-7.3	HW1 due, HW2 assigned
4	9/13	Sorting: heapsort, priority queues 7.4	
5	9/18	Sorting: quicksort 5.1-5.3	
5	9/20	Sorting: quicksort average case analysis 5.4 last section	HW2 due , HW3 assigned
6	9/25	Sorting: linear time sorting algorithms 8.1-8.2	
6	9/27	Order statistics: selection in expected linear time 8.3-8.4 9.1-9.2	
7	10/2	Order statistics: selection in worst-case linear time 9.3	HW3 due, HW4 assigned
7	10/4	Midterm 1	
8	10/9	Structures: binary search trees 12.1-12.3	
8	10/11	Structures: red-black trees 13.1-13.2	
9	10/16	Structures: red-black trees (insertion)	HW4 due, HW5 assigned
9	10/18	Structures: hash tables (hash functions)	
10	10/23	Structures: hash tables (universal hashing)	
10	10/25	Graph algorithms: the basics 22.1-22.3	HW5 due, HW6 assigned
11	10/30	Graph algorithms: DFS/BFS 22.1 23.3	
11	11/4	Minimum spanning trees 23.2 Kruskals algorithm; disjoint sets 21.1-21.3,	
12	11/6	Shortest paths: DAG, Dijkstra's algorithm 23.2 Shortest paths: Bellman-Ford 24.1-24.3	
12	11/08	Midterm 2	
13	11/13	Veterans Day - Campus Closed	
13	11/15	Dynamic programming 15.1, 15.3	HW6 due, HW7 assigned
14	11/20	Dynamic programming (longest common subsequence) 15.4	
14	11/22	Dynamic programming (knapsack problem)	
15	11/27	Greedy algorithms 16.1-16.2	
15	11/29	Thanksgivings	HW7 due, HW8 assigned
16	12/04	NP-Completeness 34.1-34.2	
16	12/06	NP-Completeness: reductions 34.3-4	

| 17 | 12/11 | Review, or additional topics | HW8 due |
| Final Exam | 12/16 | 12:00-13:15pm: Monday,0945-1200. | |

SJSU ACADEMIC YEAR CALENDAR 2019/20