San José State University
Science/Computer Science
CS 255, Design and Analysis of Algorithms, Section 1, Fall, 2023

Course and Contact Information

Instructor(s): Aikaterini Potika
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Office Hours: Mondays & Wednesdays 9:30-10 am & Mondays 12-1 pm (hybrid) or by appointment
Join from PC, Mac, Linux, iOS or Android:
https://sjsu.zoom.us/j/91441895686?pwd=Nlp1aExvU2JtaTNKY3VOblk4NEdjQT09
Password: 793531
Class Days/Time: Monday and Wednesday 1:30-2:45 pm
Classroom: Duncan Hall 450
Prerequisites: CS 155 or instructor consent

Course Description

Randomized algorithms. Parallel algorithms. Distributed algorithms. NP-completeness of particular problems. Approximation algorithms.

Course Format

Technology Intensive, Hybrid, and Online Courses
The course adopts an online classroom delivery format. An internet connection and a computer and a tablet or smartphone is required.

Faculty Web Page and MYSJSU Messaging

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found 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 on Spartan App Portal http://one.sjsu.edu (or other communication system as indicated by the instructor) to learn of any updates. For help with using Canvas see Canvas Student Resources page (http://www.sjsu.edu/ecampus/teaching-tools/canvas/student_resources).

Course Learning Outcomes (CLO)

Upon successful completion of this course, students will be able to:

- **CLO1** -- Analyze or code a randomized algorithm
- **CLO2** -- Analyze or code a parallel algorithm using a thread library
- **CLO3** -- Analyze or code a parallel algorithm using a library such as OpenCL
- **CLO4** -- Analyze the correctness and run time of a distributed algorithm

- **CLO5** -- Given a problem within NP that is promised to be either in P or NP-complete prove which it is
- **CLO6** -- Analyze or code a number theoretic algorithm
- **CLO7** -- Analyze or code an approximation algorithm for an optimization problem whose decision problem is NP-complete.

Required Texts/Readings (Required - Delete the word "Required" in final draft)

Textbook

No required textbook we will use chapters from various books:

1. Cormen, Leiserson, Rivest and Stein, Introduction to Algorithms, 3rd Edition MIT Press, 2009. You can find errata (bug reports) for the book http://www.cs.dartmouth.edu/~thc/clrs-bugs/bugs-3e.php.
2. Kleinberg and Tardos, Algorithm Design, First edition, Addison Wesley, 2005.
3. Dasgupta, Papadimitriou and Vazirani, Algorithms, McGraw-Hill, 2006.
4. Vazirani, Approximation Algorithms, Springer, 2003
5. Randomized Algorithms. Rajeev Motwani and Prabhakar Raghavan

Other technology requirements / equipment / material

Computer

Course Requirements and Assignments (Required - Delete the word "Required" in final draft)

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, including but not limited to internships, labs, and clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus.

Homework assignments: individual, regularly assigned, will include written problem assignments, and perhaps some online exercises. Solutions will not be posted. The homework is a tool for you to learn the material and prepare you for the exams.
Reading assignments: Reading assignments are regular and for the next class.
Quizzes: Unannounced quizzes (at least 4) may be given during class, each taking about 5 minutes total. These generally are problems from the reading assignment and/or the homework.
Project (Programming and Presentation): A programming project of your choice related to the course in groups of two students. At the end of the semester you will present the project in the class. Never use any code you find on the web, unless it is given by me. Penalty for late submission 5% for every 3 days up to 9 days, after that no submission will be accepted. Never email your assignments.
Midterm exams: One Midterm exam during the semester.

Final Examination or Evaluation

One final, written, and cumulative exam, split in two parts. The exams contain multiple-choice questions, short answer questions and questions that require pseudocode and/or computations.

Grading Information

No extra point options (only the final exam offers extra points option).
All exams are closed books, and the final exam is comprehensive. No make-ups exams except in case of verifiable emergency circumstances.

Determination of Grades

Final Grade:

20% Project (programming and presentation)
10% Quizzes
10% Homework
5% Participation
5% Discussions
30% Midterms (two)
20% Final

Grade	***Percentage***
A plus	96 to 100%
A	93 to 95%
A minus	90 to 92%
B plus	86 to 89 %
B	82 to 85%
B minus	78 to 82%
C plus	74 to 77%
C	70 to 73%
C minus	65 to 69%
D plus	62 to 64%
D	58 to 61%
D minus	55 to 57%
F	<54%

Classroom Protocol

Attendance is highly recommended. Please avoid disturbing the class: turn-off cell phones (or put them on vibrate mode), no text messaging in the class or the exams, no taking pictures and video, avoid coming late, no

talking or whispering with other students during the instructor's presentation. You may not publicly share or upload material from this course such as exam questions, lecture notes, or solutions without my consent.

University Policies

Per University Policy S16-9 ,relevant university policy concerning all courses, such as student responsibilities, academic integrity, accommodations, dropping and adding, consent for recording of class, etc. and available student services (e.g. learning assistance, counseling, and other resources) are listed on Syllabus Information web page (https://www.sjsu.edu/curriculum/courses/syllabus-info.php). Make sure to visit this page to review and be aware of these university policies and resources.

The instructor might drop students that do not show up during the first two lectures.

COVID-19 and Monkeypox Safety Training

Students registered for a College of Science (CoS) class with an in-person component should view the CoS COVID-19 and Monkeypox Training slides for updated CoS, SJSU, county, state and federal information and guidelines, and more information can be found on the SJSU Health Advisories website. By working together to follow these safety practices, we can keep our college safer. Failure to follow safety practice(s) outlined in the training, the SJSU Health Advisories website, or instructions from instructors, TAs or CoS Safety Staff may result in dismissal from CoS buildings, facilities or field sites. Updates will be implemented as changes occur (and posted to the same links).

CS255: Design and Analysis of Algorithms, Fall 2023

The schedule is subject to change with fair notice and announced on Canvas.

Course Schedule

Lesson	Date	Topic	Assignments
1	8/21	Syllabus	
2	8/23	Introduction: Algorithms & Computers, Challenge exam	HW 1
3	8/28	Running time, growth of functions	
4	8/30	Graphs, BFS, DFS, topological sorting	
	9/4	Break	
5	9/6	Parallel and Distributed Algorithms (Ch 12 MR)	
6	9/11	PRAM model	

7	9/13	Greedy Algorithms: Scheduling, Shortest paths, Caching, knapsack	
8	9/18	Greedy Algorithms: Minimum spanning tree, clustering	
9	9/20	Divide & Conquer: sorting, integer/matrix multiplication, max subarray	HW 2
10	9/25	Divide & Conquer: computational geometry	
11	9/27	Dynamic Programming: scheduling, knapsack	
	10/2	Midterm 1	
12	10/4	Dynamic Programming: all pair shortest path	
13	10/9	Network flow, applications	Project proposal (due)
14	10/11	Network flow, applications	
15	10/16	Heaps, Amortized Analysis	
16	10/18	Amortized Analysis cont.	
17	10/23	Randomization: Quicksort	Project Sprint 1 (due)
18	10/25	Randomization: Hashing	
19	10/30	Intractability, P, NP, NP-completeness,	
20	11/1	Intractability, P, NP, NP-completeness, reductions	
21	11/6	Intractability, P, NP, NP-completeness, reductions	Project Sprint 2 (due)
22	11/8	Midterm 2	HW 3
23	11/13	Intractability, P, NP, NP-completeness, reductions	
24	11/15	Approximation Algorithms	
25	11/20	Approximation Algorithms	Project Sprint 3 (due)
	11/22	Break	
26	11/27	Distributed Algorithms	
27	11/29	Distributed Algorithms	

28	12/4	Project Presentations	
29	12/6	Project Presentations	
	Final	Wednesday, December 13 12:15-2:30 PM	