SJSU SAN JOSÉ STATE UNIVERSITY

College of Science · Computer Science

Design and Analysis of Algorithms Section 01

CS 255

Spring 2024 3 Unit(s) 01/24/2024 to 05/13/2024 Modified 01/31/2024

Contact Information

Instructor: Peter McGlaughlin

Email: peter.mcglaughlin@sjsu.edu
Office: Duncan Hall 282

Office Hours

Tuesday 12-1:30pm
Duncan Hall 282

Thursday 4:30-6pm
Duncan Hall 282

Course Information

Class Location: Clark Building 111

Class Times: 3-4:15pm Tu/Th

Course Description and Requisites

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

Prerequisite(s): CS 155 and Graduate standing. Allowed Declared Major: Computer Science, Bioinformatics, Data Science. Or instructor consent.

Letter Graded

Classroom Protocols

Do NOT share any course material publicly (on Canvas, GitHub, etc.) without permission, including but not limited to lecture notes, lecture videos, passwords, homework/exam solutions, and class meeting links.

Program Information

Diversity Statement - At SJSU, it is important to create a safe learning environment where we can explore, learn, and grow together. We strive to build a diverse, equitable, inclusive culture that values, encourages, and supports students from all backgrounds and experiences.

Course Goals

To develop an in-depth understanding of algorithm design techniques and the analysis of algorithms and to present a substantial introduction to computational complexity and NP-completeness.

Course Learning Outcomes (CLOs)

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

- CL01: Code an example of each of the following types of algorithms:
  - Randomized
  - Parallel
  - Approximation
- CL02: Conduct an amortized analysis.
- CL03: Explain how the above techniques are used in several applications and describe what benefits they have within those applications.

Course Materials

Textbook:

Kleinberg, Jon and Tardos, Éva, Algorithm Design, Addison-Wesley, 2006, ISBN 0-321-29535-8

Cormen, Leiserson, Rivest, and Stein, Introduction to Algorithms, third edition. MIT Press, 2009. ISBN-10: 0262033844 ISBN-13: 978-0262033848

Course Requirements and Assignments

The following may be assigned:

- Reading Assignments or Handouts
- In Class Discussions, Activities, and Exercises

- Midterm Exam: There will be one exam during the semester.
- Final Exam: The final exam will be comprehensive for the semester.

University Policy S16-9 (http://www.sjsu.edu/senate/docs/S16-9.pdf) states that:

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.

Technology Intensive, Hybrid, and Online Courses

All students are required to have access to a wireless laptop (running OSX, Windows, or some version of UNIX), upon which you can install required software. Technology used will include Canvas, programming in Java, and an IDE (Integrated Development Environment).

Course Webpage and MYSJSU Messaging

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on *Canvas Learning Management System course login website*. You are responsible for regularly checking with the messaging system through *MySJSU* on *Spartan App Portal* (or other communication system as indicated by the instructor) to learn of any updates.

✔ Grading Information

Course weightings will be as follows:

0% Weekly Exercises - There will be 3 to 4 ungraded problems assigned each week. These problems are a chance to check your understanding of and ability to apply important concepts from lecture. About 50% of the questions on exams will come from these problems or minor variations on them.

30% Homework Assignments - There will be 5 to 6 homework assignments throughout the semester. The lowest score will be dropped. Homeworks will be more challenging than weekly exercises and will teach you new techniques. You will have 2 weeks to complete an assignment, and may work in groups of up to 3 students. One submission per group. More details on assignments can be found on Canvas.

30% Midterm Exam - tentative March 28 (in class)

40% Final Exam - Tuesday May 21, 2:45-5pm

Your course grade will be determined by your final weighted average:

A plus = 97% or higher

A = 93% up to 97%

A minus = 90% to 93%

B plus = 87% to 90%

B = 83% to 87%

B minus = 80% to 83%

C plus = 77% to 80%

C = 73% to 77%

C minus = 70% to 73%

D plus = 67% to 70%

D = 63% to 67%

D minus = 60% to 63%

F = 0% to 60%

Boundary cases count as the higher of the two grades.

Final grades may be curved. Any curve will only benefit students. Details can be found on canvas. I also reserve the right to increase your final grade by 1/3 of a letter grade for class participation.

All students have the right, within a reasonable time, to know their academic scores, to review their grade-dependent work, and to be provided with explanations for the determination of their course grades. See University Policy S20-2 for more details.

University Policies

Per University Policy S16-9 (PDF) (http://www.sjsu.edu/senate/docs/S16-9.pdf), 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 the Syllabus Information (https://www.sjsu.edu/curriculum/courses/syllabus-info.php) web page. Make sure to visit this page to review and be aware of these university policies and resources.

Course Schedule

When	Topic	Notes
Week 1	Introduction	

When	Topic	Notes
Week 2	Randomized Algorithms	
Week 3	Randomized Algorithms	
Week 4	Randomized Algorithms	
Week 5	Parallel Algorithms	
Week 6	Max-flow	
Week 7	Max-flow Applications	
Week 8	Max-flow generalizations	
Week 9	Linear Programming	
Week 10	Finish LP, Midterm	
Week 11	Spring Break	
Week 12	Online Algorithms	
Week 13	Reductions, NP	
Week 14	Finish NP, Start Approximation Algorithms	
Week 15	Approximation Algorithms	
Week 16	Distributed Algorithms	