Introduction to Analysis of Algorithms

Spring 2021

CSE 102 [previously CMPS 102]
Section 01

Teaching Staff

Section	Instructor	Email	Office	Office Hours
01	Suresh K. Lodha (SKL)	lodha@soe.ucsc.edu	Online	MW 7:00-8:30pm

Teaching Assistants: Joseph Rodriguez (jrodr104@ucsc.edu) or JD
Negin Majidi (nemajidi@ucsc.edu) or NM

Tutors/Readers: Aditya Tarde (atarde@ucsc.edu) or AT
Joseph Pehlke (jompehlk@ucsc.edu) or JP
Theodore Novak (tjnovak@ucsc.edu) or TN

Class Location	**Meeting Times**
Online (zoom links on canvas) login using ucsc.edu email	MW 5:20-6:55pm

Zoom, Laptop, and Internet Connection

In order to have a successful experience with the course, students are expected to be competent in using zoom – raising hands, sharing screen, asking questions, making class presentations, using (or muting) video, using (or muting) audio, preferably **using a virtual background** while using a video.

Students are expected to have a working laptop with adequate internet speed to attend zoom lectures and take during-the-class quizzes, midterms and the final exam.

During quizzes and examinations, students will be *required* to put their videos on where the face is visible. If this condition is not met, then the student may be awarded a zero in the quiz. This is a no tolerance policy. It is the student's responsibility to ensure that they have a proper video connection.

Students will have to log into zoom using ucsc.edu email account. Login process will require registration/authentication. Zoom will automatically record every student's entry and exit time for each class. Thus, zoom automatically provides attendance record of every student.

Lectures

Lectures will be delivered via zoom at the class meeting times. Every attempt will be made to make the recorded lectures available on canvas after the lecture. However, availability of recorded lectures is NOT guaranteed in case of technical problems during the recording beyond the control of the instructor.

Class Attendance
Although attendance is not required during classes, **quizzes will be given during the class times**. We encourage students to attend classes.

Discussion sections/Office Hours/Tutoring Hours (delivered through zoom) There will be no TA-initiated discussion sections. However, plenty of office hours/tutoring hours will be held by the teaching assistants and reader/tutors. These group tutoring times can be utilized to seek clarification on topics covered in the lecture, homework, quiz, and associated topics.

Prerequisites
CSE 101 or CMPS 101. CSE 102 is a theory course. No programming is required. Students are expected to have familiarity with asymptotic notation, the reading and writing of formal proofs, elementary data structures (lists, stacks, queues, sorted arrays, heaps, trees, etc.), graphs (depth- and breadth-first search, shortest paths, etc.), basic mathematical tools (arithmetic and geometric series, logarithms, polynomials, and exponential functions, counting permutations and subsets), logic (negation and nested quantification), basic calculus (integration, differentiation, limits), vectors and matrices.

Syllabus (tentative)
1. Introduction to Analysis of Algorithms
(Recurrence and Induction, Asymptotic Growth, Common Functions and Masters Theorem)
2. Motivating Examples
3. Basics of Algorithm Analysis
4. Divide and Conquer Algorithms
5. Greedy Algorithms
6. Dynamic Programming
7. Lower Bounds, Adversary Arguments and Computational Complexity
8. NP-Complete Problems and Approximation Algorithms
In the unlikely event that things move faster, graph algorithms such as network flow algorithms may be discussed.

The instructor will focus on providing high quality education. Online instruction will not be diluted in quality or cover less material. On the contrary, online instruction expects students to be even more disciplined and motivated to learn the materials, sometimes ahead of time, or at their own initiative, because valuable *in-person* learning and engagement with the teaching staff will not be available.

Recommended Books
- Introduction to Algorithms, Third Edition by Thomas Cormen, Charles Leiserson, Ronald Rivest, and Clifford Stein. MIT Press, 2009. (CLRS)
- Algorithm Design by Kleinberg and Tardos, Pearson Education, 2012 (KT)
- Algorithms by Sanjoy Dasgupta, Christos Papadimitriou, and Umesh Vazirani. McGraw Hill, 2006. (DP)
- Fundamentals of Algorithmics by G. Brassard and P. Bratley.
- Computer Algorithms by S. Basse and A. Van Gelder, Addison-Wesley.
- Computer Algorithms by Horowitz, Sahani, and Rajasekaran, Freeman and Company.

e-copies of these books should be available freely on the internet. A slightly older edition may also work. The instructor will borrow course materials from all of these books and will expect students to have access to them.

Learning Management Platforms

Canvas	Canvas will be used for all homework and communicating all grades including assignment grades. Canvas will be used for all quizzes, midterm, and final exams. Canvas will also be used for week-by-week outline of lectures, uploading all course materials including syllabus, and zoom link, and announcements.
Piazza	Access to Piazza Page is through Canvas. Piazza page will be used for queries and announcements.

Communication Policy
All questions related to the course should be posted on Canvas Discussion Forum. The teaching staff will attempt to answer them promptly. The forum should NOT be used to post complaints or grievances against any teaching staff or peers. Any student who violates this rule may be barred from the forum and be asked to drop the class.

Additionally, we encourage students to ask all course-related questions – contents or delivery – during online zoom sessions during lecture times or during virtual office hours. You are encouraged to ask individualized questions during instructor's office hours. Posting private notes visible only to the instructors is also a choice. All appeals/complaints regarding late submissions, missing quizzes etc. must be submitted on canvas under "Good, Bad, and Ugly".

It may not be possible for the teaching staff – instructor, teaching assistants, tutor-readers – to respond to emails from students of such a large class.

Zero Tolerance Policy
There will be zero tolerance policy against zoom-bombing. This includes use of offensive language in chat sessions during class times, or use of offensive virtual background during video chats. Students will be immediately removed from the class and strict action will be taken. Zoom links for the class must not be shared with anyone.

Disability Accommodation
UC Santa Cruz is committed to creating an academic environment that supports its diverse student body. If you are a student with a disability who requires accommodations to achieve equal access in this course, please submit your Academic Access Letter from the Disability Resource Center (DRC) to me privately during my office hours at the earliest, preferably within the first week of the quarter and definitely within the first two weeks of the quarter and/or through DRC page on canvas. At this time, I would also like us to discuss ways we can ensure your full participation in the course. I encourage all students who may benefit from learning more about DRC services to contact DRC by phone at 831-459-2089 or by email at drc@ucsc.edu.

If you have DRC accommodation, please upload your documents ASAP on canvas under "DRC Accommodation" in assignment section. If you are planning to apply for the accommodation, you must inform this in writing under the comments section in "DRC Accommodation" clearly stating when you expect to apply, when DRC expects to review your application, when a decision is expected, and your expectation of how much time accommodation (such as 2x) is expected. In addition, please interact with the instructor ASAP during virtual office hours

bringing his attention to your accommodation preferably during the very first week of classes and at the latest by the 2nd week of classes.

Honesty and Integrity
The CSE department has a zero-tolerance policy on academic dishonesty. Consequences within the class range from a zero on the entire assignment to failing the course, and are reported to the College Provost who will set formal proceedings in motion that can lead to suspension or expulsion from the university. See also http://www.ucsc.edu/academics/academic_integrity/undergraduate_students

Cheating is presenting someone else's work as your own. This includes copying another students homework or allowing a student to copy your solutions. Any help you get on a homework (from any source other than the TAs, instructor, and text book) must be clearly described and acknowledged on your submission. Such help includes key discussions with other students, help from the MSI tutors, discussion on discord, and information from the web or solution manuals. *Any attempt to hide or not provide this information at the time of submission will be considered cheating*.

Exceptional Circumstances
If you need accommodation due to family emergencies, or serious illness or injury, inform the instructor as soon as possible. An "incomplete" may be awarded only in exceptional circumstances.

Evaluation Policy Outline
The final grade will be decided as follows:
Homework: 10%
Weekly Portfolio: 10% (possibly -20% with penalty points)
Quizzes: 40%
Evaluation of remaining 40% is described in a separate document.

Homework will be given regularly. These are open book, open notes, open peer assistance. Details of grading will be posted separately.

Every student will be evaluated on a weekly basis with 1-1 interaction online by a teaching staff. Summary of this engagement, as submitted by the student, is *weekly portfolio*. If the student does not make an appointment, or miss an appointment, or arrives late in the appointment, or is unprepared during the appointment, negative penalty points will be awarded.

Quizzes
More information will be provided on the quizzes at the beginning of the class and in a separate document. There will be 5-7 quizzes. Quizzes will be open book, open notes, but no cell phone or internet sources or peer assistance will be allowed. Every attempt will be made to keep every quiz question clear (and not ambiguous). Quizzes were rated as hard and lengthy by most students during the previous offering of this class during Fall 2020.

Grades
Students will be placed in Tiers 0, 1, 2, 3, and 4 on the basis of 60% grades described above. Since most students receive full points (or close to full points) on HW and Weekly Portfolio, your tier will be decided primarily on the basis of the quiz grades.

The rough distribution of **primary grades** of 120 students will be based on the tiers as follows:
~24 students; Top 20% (Tier 4): A/A+

~ 24 students: Next 20% (Tier 3): B+/A-
~ 24 students; Middle 20% (Tier 2): B-/B
~24 students; Between 20-40 percentile;(Tier 1): C/C+
~24 students: Bottom 20% (Tier 0): F

The grading will be based on above quintization (grouping of students in 5 tiers). In other words, an easy quiz, where most student do very well, will be essentially washed out. The quizzes will be designed to produce bell-shaped distribution. In other words, there will be 20% students who will do poorly and additional 20% students who will perform clearly below satisfactory level. Many students during Fall 2020 were unhappy with this grading criteria because there will be roughly 50 students (those who are likely to end up with F, C, C+, at the risk of not passing the class. The grading criteria will *not* be diluted in favor of any senior student for whom this class/quarter is the last one to pass/graduate.

On the bright side, students will have the opportunity to improve their grades (and pass the course) or maintain their grades (particularly in the case of Tier 3 and Tier 4 Students) by demonstrating additional efforts. Further details of evaluation policy will be described at the beginning of the course. Every student will be **required** to interact with a teaching staff member on a regular weekly basis for 10 minutes to explain the quiz, midterm, and homework solutions. The instructor was criticized for this policy during Fall 2020 since some students could not explain anything with extremely poor understanding of the material even though they could copy-paste the solutions found elsewhere. As a consequence, students who are attempting to pass the course via plagiarism, cheating, or other means, will be detected. By the end of the quarter, the instructor hopes to have interacted with every student in the class in-depth providing insightful feedback on learning of every student in the best traditions of ex-UCSC when the university was world-renowned due to its narrative evaluation system.

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