

# CS255 Spring 2019 Sec1 Home Page/Syllabus

## Design and Analysis of Algorithms

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**Office Hours:** MW 4:30-5:30pm  
**Class Meets:**  
**Sec1** MW 1:30-2:45pm in MH422

## Prerequisites

To take this class you must have taken:

[CS155](#)

with a grade of C- or better.

## Texts and Links

|   |  |
|---|--|
| <b>Required Texts:</b>                    | <a href="#">Introduction to Algorithms, 3rd Ed.</a> . Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein<br><a href="#">Randomized Algorithms</a> . Rajeev Motwani and Prabhakar Raghavan |
| <b>Online References and Other Links:</b> | <a href="#">Java Website</a> .<br><a href="#">Python Website</a> .   |

## Description

This course covers the basics of randomized algorithms, parallel algorithms, distributed algorithms, algorithms related to the theory of NP-completeness, and approximation algorithms. Randomized algorithms are algorithms which make use of a random number generator. For instance, one fast way to check if a number is prime makes use of such a generator. Parallel algorithms are algorithms which are designed to be partitionable with minimal overhead among many processors who share a global clock. Distributed algorithms are algorithms designed to work on multiple processors which don't share a global clock. An example situation might be to get an algorithm to get a bunch of computers on a network to agree on a common value. NP problems are languages with polynomial time proofs of membership. For instance, given a potential factorization of a number we can in polynomial time check whether it is correct. NP-complete problems are problems in NP to which any other problem in NP can polynomially time reduced. We will consider different algorithms for during this kind of reduction. Approximations algorithms are usually efficient algorithms which approximately solve some optimization problem which is not known to have a efficient solutions. For instance, one might have an algorithm which approximately finds a traveling salesman tour. In addition to these algorithms, we will also go over the computer algebra algorithms necessary to do basic cryptographic protocols such as RSA. By the end of this course, you should be able to code one example of a randomized algorithm, parallel algorithm, distributed algorithm, a polynomial time reduction, an approximation algorithm, and a computer algebra algorithm.

## Course Learning Outcomes (CLOs)

By the end of this course, a student should 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 a optimization problem whose decision problem is NP-complete.

## Course Schedule

Below is a tentative time table for when we'll do things this quarter:

|                             |  |
|-----------------------------|--|
| Week 1:Jan 28, Jan 30       | Appendix C, Start Chapter 5 Probabilistic and Randomized Algorithms (CLRS) |
| Week 2:Feb 4, Feb 6         | Finish Ch5, Start Ch 27 Multithreaded Algorithms (CLRS)                    |
| Week 3:Feb 11(Hw1), Feb 13  | Finish Ch 27   |
| Week 4:Feb 18, Feb 20       | Read Ch 12 Parallel and Distributed Algorithms (MR)                        |
| Week 5:Feb 25, Feb 27       | Map Reduce Paper, Read Ch 13 Online Algorithms (MR)                        |
| Week 6:Feb 25, Feb 27       | Start Ch 31 (CLRS) and Ch 14 (MR) Number Theoretic Algorithms              |
| Week 7:Mar 4(Hw2), Mar 6    | Finish Ch 31   |
| Week 8:Mar 11, Mar 13       | Start Ch 34 NP, and NP-completeness (CLRS)                                 |
| Week 9:Mar 18, Mar 20       | Ch 34 NP-Completeness (CLRS)   |
| Week 10:Mar 25(Hw3), Mar 27 | Review   |
| Week 11:Apr 1, Apr 3        | Spring Recess  |
| Week 12:Apr 8, Apr 10       | Finish Ch 34   |
| Week 13:Apr 15, Apr 17(Hw4) | Start Ch 35 Approximation Algorithms                                       |
| Week 14:Apr 22, Apr 24      | Finish Ch 35   |
| Week 15:Apr 29, May 1       | Start Ch 5 The Probabilistic Method (MR)                                   |
| Week 16:May 6, May 8        | Finish Ch 5 MR   |
| Week 17:May 13(Hw5)         | Review   |
|                             | The final will be Thursday, May 16 from 12:15pm-2:30pm                     |

## Grading

|                        |      |
|------------------------|------|
| <b>HWs and Quizzes</b> | 50%  |
| <b>Midterm</b>         | 20%  |
| <b>Final</b>           | 30%  |
| <b>Total</b>           | 100% |

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Grades will be calculated in the following manner: The person or persons with the highest aggregate score will receive an A+. A score of 55 will be the cut-off for a B-. The region between this high and low score will be divided into five equal-sized regions. From the top region to the low region, a score falling within a region receives the grade: A, A-, B+, B, B-. If the boundary between an A and an A- is 85, then the score 85 counts as an A-. Scores below 55 but above 50 receive the grade D. Those below 50 receive the grade F.

If you do better than an A- in this class and want me to write you a letter of recommendation, I will generally be willing provided you ask me within two years of taking my course. Be advised that I write better letters if I know you to some degree.

## Course Requirements, Homework, Quiz Info, and In-class exercises

This semester we will have five homeworks, weekly quizzes, and weekly in-class exercises.

Every Monday this semester, except the first day of class, the Midterm Review Day, and holidays, there will be a quiz on the previous week's material. The answer to the quiz will either be multiple choice, true-false, or a simple numeric answer that does not require a calculator. Each quiz is worth a maximum of 1pt with no partial credit being given. Out of the total of twelve quizzes this semester, I will keep your ten best scores.

On Wednesday's, we will spend 15-20 minutes of class on an in-class exercise. You will be asked to post your solution to these exercises to the class discussion board. Doing so is worth 1 "pre-point" towards your grade. A "pre-point" can be used to get one missed point back on a midterm or final, up to half of that test's total score. For example, if you scored 0 on the midterm and have 10 pre-points, you can use your pre-points, so that your midterm score is a 10. On the other hand, if you score 18/20 on the midterm, you can use at most 1 pre-point since half of what you missed (2pts) on the midterm is 1pt.

Links to the current list of homeworks and quizzes can be found on the left hand side of the class homepage. After an assignment has been returned, a link to its solution (based on the best student solutions) will be placed off the assignment page. Material from assignments may appear on midterms and finals. **For homeworks you are encouraged to work in groups of up to three people. Only one person out of this group needs to submit the homework assignment; however, the members of the group need to be clearly identified in all submitted files.**

Homeworks for this class will be submitted and returned completely electronically. To submit an assignment click on the submit homework link for your section on the left hand side of the homepage and filling out the on-line form. Hardcopies or e-mail versions of your assignments will be rejected and not receive credit. Homeworks will always be due by the start of class on the day their due. Late homeworks will not be accepted and missed quizzes cannot be made up; however, your lowest score amongst the five homeworks and your quiz total will be dropped.

When doing the programming part of an assignment please make sure to adhere to the specification given as closely as possible. Names of files should be as given, etc. Failure to follow the specification may result in your homework not being graded and you receiving a zero for your work.

## Classroom Protocol

I will start lecturing close to the official start time for this class modulo getting tangled up in any audio/visual presentation tools I am using. Once I start lecturing, please refrain from talking to each other, answering your cell phone, etc. If something I am talking about is unclear to you, feel free to ask a question about it. Typically, on practice tests days, you will get to work in groups, and in so doing, turn your desks facing each other, etc. Please return your desks back to the way they were at the end of class. This class has an online class discussion board which can be used to post questions relating to the homework and tests. Please keep discussions on this board civil. This board will be moderated. Class and discussion board participation,

although not a component of your grade, will be considered if you ask me to write you a letter of recommendation.

## Exams

The midterm will be during class time on: Mar 27.

The final will be: Thursday, May 16 from 12:15pm-2:30pm.

All exams are closed book, closed notes and in this classroom. You will be allowed only the test and your pen or pencil on your desk during these exams. The final will cover material from the whole semester although there will be an emphasis on material after the last midterm. No make ups will be given. The final exam may be scaled to replace a midterm grade if it was missed under provably legitimate circumstances. These exams will test whether or not you have mastered the material both presented in class or assigned as homework during the quarter. My exams usually consist of a series of essay style questions. I try to avoid making tricky problems. The week before each exam I will give out a list of problems representative of the level of difficulty of problems the student will be expected to answer on the exam. Any disputes concerning grades on exams should be directed to me, Professor Pollett.

## Regrades

If you believe an error was made in the grading of your program or exam, you may request **in person** a regrade from me, Professor Pollett, during my office hours. **I do not accept e-mail requests for regrades.** A request for a regrade must be made no more than a week after the homework or a midterm is returned. If you cannot find me before the end of the semester and you would like to request a regrade of your final, you may see me **in person** at the start of the immediately following semester.

## University Policies and Procedures

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/>. Below are some brief comments on some of these policies as they pertain to this class.

### Academic Integrity

For this class, you should obviously not cheat on tests. For homeworks, you should not discuss or share code or problem solutions between groups! At a minimum a 0 on the assignment or test will be given. A student caught using resources like Rent-a-coder will receive an F for the course. Faculty members are required to report all infractions to the Office of Student Conduct and Ethical Development.

### Accommodations

If you need a classroom accommodation for this class, and have registered with the [Accessible Education Center](#), please come see me earlier rather than later in the semester to give me a heads up on how to be of assistance.