Overview

This course introduces you to the concepts and techniques of algorithm design and analysis. Students who complete the course will understand the role of algorithms in computer science; will become familiar with a number of classical computer science algorithms and will understand the meaning and the significance of complexity classes P, NP, NP-complete and NP-hard and will know examples of problems from these classes.

Textbook


Topics

The following will be covered in the course.
<table>
<thead>
<tr>
<th>No.</th>
<th>Topic</th>
<th>Duration (weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Introduction: algorithms and algorithm analysis</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>Divide and conquer algorithms</td>
<td>1.5</td>
</tr>
<tr>
<td>3.</td>
<td>Graph Algorithms</td>
<td>2</td>
</tr>
<tr>
<td>4.</td>
<td>Greedy Algorithms</td>
<td>1</td>
</tr>
<tr>
<td>5.</td>
<td>Dynamic Programming</td>
<td>2.5</td>
</tr>
<tr>
<td>6.</td>
<td>Complexity and NP-Completeness</td>
<td>2</td>
</tr>
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Most of the topics will be covered in the order specified above, but some divergence is possible.

**Note.** I will be out of town for Monday, October 16 and Wednesday, October 18 classes. The classes and the labs will take place. I will announce the activities (and the replacement instructors/proctors) the week before my absences, but you should expect at least one period to be occupied by a quiz.

CSC 349 in Fall 2020. There are seven CSC 349 sections taught by four different instructors (Dr. Theresa Migler, Dr. Rodrigo Canaan, Chris Siu and myself). While most of the material in all courses will be the same (give or take an algorithm or two), the manner in which the material is presented, and your overall experiences may vary from those of your peers in other sections. Please be aware of it.

**Grading**

- **Homeworks and Labs** 30-40%
- **Quizzes** 35-40%
- **Final Exam** 25-35%

I give relatively hard problems and take points off on exams. Because of this, the traditional 90-A, 80-B, 70-C grading schema does not work in my classes. Historically, the A/B cutoff has been around 80-85%, while the B/C cutoff has been around 70%.

**Possible CFA action**

The CSU Faculty Union (CFA) is currently engaged in bargaining with the CSU Administration over the next faculty contract. The current state of the bargaining makes it possible that the CFA will call for action some time during the Fall quarter. One such actions may be a strike. In case the strike is called and falls on the day or the days of our classes, all classes on those days will not take place. If the strike falls on a day when there is no class, it may lead to delays with grading of your work commensurate with the duration of the strike.

For more information, please refer to the CFA (California Faculty Association) web site. If CFA calls for concerted action, I will inform the class about the date(s) and the expected impact on the course.

**Course Policies**

**Exams and quizzes**

The course has a final exam and four quizzes. There is no midterm exam.

The final exam time is **Wednesday, December 13, 4:10 - 7:00pm**.

Quizzes are paper-and-pencil, and will take a 50-minute fragment of the class. We typically start the day with the quiz, however quizzes are considered to be done during lab times, so upon completion of the quiz, we will use the second 50 minute period as a lecture. The tentative days of the quizzes are shown below.
<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 16 (Monday)</td>
<td>Divide-and-conquer algorithms</td>
</tr>
<tr>
<td>November 1 (Wednesday)</td>
<td>Graph Algorithms</td>
</tr>
<tr>
<td>November 13 (Monday)</td>
<td>Greedy Algorithms</td>
</tr>
<tr>
<td>November 29 (Wednesday)</td>
<td>Dynamic Programming</td>
</tr>
</tbody>
</table>

The quizzes will be announced/confirmed at least one class ahead of time.

**Homeworks, Labs**

There will be 4-8 lab assignments and, a number of homework assignments.

*Lab assignments* are intended to give you hands-on experience with designing and implementing well-known algorithms and applying classical problem-solving techniques. Most of the lab assignments will be done in pairs or small groups, although individual assignments are possible as well. In addition to implementing the algorithms covered in class, you may be asked to conduct empirical run-time analysis of your implementations. In some cases this would mean implementing data generation and test harnesses for your algorithms, so expect the software development component of the labs to be moderate in size.

Your main deliverables for the lab assignments that feature performance evaluations will be reports documenting your work and visualizing the results you obtained, and your conclusions. Creating such reports also takes time, so when allocating time for your work on CSC 349 labs, please take this into account.

*Paper-and-pencil* homework assignments will test your problem-solving skills related to algorithm design and analysis. They will also prepare you for the quizzes and the final exam. Some of these assignments will be graded, some may receive a "participation" grade (i.e., a grade for submitting your work). We may use some lab periods in this course to work on some of the problems from the homework assignments.

**Programming Languages**

We will use Python and Java as our programming languages for lab assignments.

Most of my examples in class will be in Python (because they are easier to demo, in fact, most of my demos will be using the Jupyter platform, also available to you in the course). I reserve the right to make certain labs language-specific.

**Use of Generative AI tools.**

Use of generative AI tools to create any code that is part of your assignment submissions contradicts the core learning objectives of CSC 349 (learning how algorithms are devised and implemented). As such, it is not allowed, and any AI-generated code submitted as part of your assignment deliverables will be treated as an instance of academic cheating (see Academic Integrity Policies below).

Similarly, use of generative AI to create any written portions of your assignment deliverables (homework problem solutions, lab assignment reports) is *not consistent* with the intent and the learning objectives of the course. As such, it is not allowed.

**Late Submissions**

**Homeworks.** Homework assignments are due at the beginning of the class on the due date, with the grace period extending through the end of the lab period. Homework assignments should be submitted in hard copy.

If paper-and-pencil homework solutions are distributed on the due date of the homework, *late homework submissions will not be accepted*. Otherwise, late homeworks can be submitted during next 24 hours for a nominal (5-20%) penalty.
Lab assignments. Lab assignment due dates in times will be explicitly stated on each assignment. Most lab assignments (including reports) will be submitted through handin. Usually, there is a 16-24 hour grace period for assignment submissions - this extension depends on when the assignments are due and when I am planning to collect them from the handin directory.

Late lab assignment submissions can be turned in before or at the beginning of the next lab period for a 10-30% penalty (the exact amount will depend on the submission time and the specific circumstances. No lab assignments can be submitted for credit after that.

Extensions. If you have circumstances that affect your ability to submit on time, first and foremost, please inform me of them. I will work with you on a case-by-case basis to find an accommodation that helps you, while allowing us to grade your work promptly.

Communication

Slack. The main communication mechanism for the course is the Slack workspace. You should have all received Slack invitations from me. Joining the Slack workspace for the course is mandatory. I will be using Slack to communicate all important announcements. I am also hoping to use it to communicate with you individually (in my experience, Slack conversations are more productive than email exchanges). Similarly, if you want to communicate with me about something related to the course, Slack (either public channels, or one-on-one chats) is the best way to both attract my attention, and receive a comprehensive response.

Mailing list. The class has an official mailing list. The email address for the mailing list is csc-349-01-2238@calpoly.edu. All students enrolled in the class are automatically subscribed to the mailing list. I will use the mailing list at the beginning of the course (before everyone joins slack) to duplicate any important announcements, but, generally speaking, unless there are emergencies, Slack will be the preferred methods of broadcasting messages to you.

Email. I encourage questions during classtime and questions via email, should you choose email over Slack private chat. My answers to email questions may be broadcast to the entire class via the mailing list or Slack if the answer may be relevant to everyone (e.g. a correction in a text of a handout, or a clarification of a homework problem).

Web Page

Class web page can be found at

http://www.csc.calpoly.edu/~dekhtyar/349-Fall2023

Through this page you will be able to access all class handouts including homeworks, project information and lecture notes (should the latter be written).

Links to web pages with additional information will also be posted.

Please note: this course does not use Canvas.

Students with Disabilities

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and the Disability Resource Center, Building 124, Room 119, at (805) 756-1395, as early as possible in the term.
Academic Integrity

University Policies

Cal Poly’s Academic Integrity policies are found at

http://www.academicprograms.calpoly.edu/content/academicpolicies/Cheating

In particular, these policies define cheating as

“…obtaining or attempting to obtain, or aiding another to obtain credit for work, or any improvement in evaluation of performance, by any dishonest or deceptive means. Cheating includes, but is not limited to: lying; copying from another’s test or examination; discussion of answers or questions on an examination or test, unless such discussion is specifically authorized by the instructor; taking or receiving copies of an exam without the permission of the instructor; using or displaying notes, ”cheat sheets,” or other information devices inappropriate to the prescribed test conditions; allowing someone other than the officially enrolled student to represent same.”

Plagiarism, per University policies is defined as

“… the act of using the ideas or work of another person or persons as if they were one’s own without giving proper credit to the source. Such an act is not plagiarism if it is ascertained that the ideas were arrived through independent reasoning or logic or where the thought or idea is common knowledge. Acknowledgement of an original author or source must be made through appropriate references; i.e., quotation marks, footnotes, or commentary.”

University policies state: ”Cheating requires, at a minimum, an ”F” assigned to the assignment, exam, or task, and this ”F” must be reflected in the course grade. The instructor may assign an ”F” course grade for an incidence of cheating.”

Additionally, the procedure for addressing cheating specifies: ”Irrespective of whether an appeal is made, the instructor is obligated to submit to the OSRR director a Confidential Faculty Report of Academic Dishonesty. Physical evidence, circumstantial evidence, and testimony of observation may be attached.”

University policies for addressing plagiarism give instructors more leeway in dealing with it: ”Plagiarism may be considered a form of cheating and therefore subject to the same procedure which requires notification to the OSRR director and, at a minimum, an ”F” assigned to the assignment, exam, or task. However, plagiarism may be the result of poor learning or poor attention to format, and may occur without any intent to deceive; consequently, some instructor discretion is appropriate. Provided that there was no obvious intent to deceive; consequently, some instructor discretion is appropriate.”

Course Policies

Violations of Academic Integrity occur where there is pressure on the student and an opportunity for some form of cheating. CSC 349 assignments are out of necessity such that there is plenty of opportunity. If you feel the pressure (that may be coming in the form of a looming deadline, issues with coursework in other classes, or issues outside the classroom), I would much rather that you contacted me and discussed the assignment and your situation with me before you commit an act of academic cheating.

Having said that, the other side of the coin is that any academic cheating that is revealed as part of the course will be dealt with according to the University policies, which means reporting cases to the Department and Office of Student Rights and Responsibilities (OSSR), with OSSR making the final determination in any cases referred to them.

To that end, here are the specific policies for the course, in addition to the no generative AI policy. You are allowed to collaborate on homework, but (a) each student must submit their own copy of the solutions, written by them, and (b) if you collaborated on homework, please put the names of the students you worked with on your submission. This will not affect your grade, but will allow me to better understand
the dynamics of the class. Lab assignments are to be completed by the appropriate units (individual, pair, group), and no code/solution-sharing between units is permitted. Students are encouraged to discuss class content among themselves but NOT in a manner that constitutes plagiarism and cheating as defined above.