Computer Science 421 - Algorithms
Fall 2018
3 semester credits

"We have so much time and so little to do. Strike that, reverse it."
– Roald Dahl, *Charlie and the Chocolate Factory*

Catalog Description.
Asymptotic analysis and recurrences. Divide-and-conquer, dynamic programming, greedy algorithms, graph algorithms, and string matching. Introduction to tractability and NP-Completeness.

Prerequisite.
CS 321, Data Structures

Textbook. *Introduction to Algorithms.* Cormen, T. H., Leiserson, C. E., Rivest, R. L., & Stein, C. (2009). ISBN: 9780262033848.

Attendance.
Students are expected to attend all classes. Material presented in class may not be covered in the textbook, or may be presented using different methods. Missing classes without explanation may also result in a grade penalty.

Piazza Discussion Forum.
The Piazza discussion forum will be used for posting questions and answers about assignments and course material, and for disseminating information. Participation is highly encouraged. A link to the Piazza website is available on the class homepage.

Academic Honesty. As a Boise State University student, you have agreed to abide by the Universitys academic honesty policy. All academic work must meet the standards described here: https://deanofstudents.boisestate.edu/academic-integrity/.

Lack of knowledge of the academic honesty policy is not a reasonable explanation for a violation. Questions related to course assignments and the academic honesty policy should be directed to the instructor.

Extra Help. Do not hesitate to come by my office during business hours to discuss a homework problem or any aspect of the course. I will be in my office during office hours, which are posted on the class homepage, but I normally can help any time that I'm in my office.

Course Objectives. Students who complete the course will have demonstrated the ability to do the following:

- Analyze worst-case running times of algorithms using asymptotic analysis. Compare the asymptotic behaviors of functions obtained by elementary composition of polynomials, exponentials, and logarithmic functions.
- Describe the brute-force paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize brute-force algorithms, and analyze them.
- Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
- Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.
- Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate. Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyze them.

Grading. The final grade will be based on the problem sets, take-home exercises, one in-class exam (Exam 1), one take-home exam (Exam 2), and a take-home final exam. Points will be awarded according to the following breakdown:

Graded Event	**Points**
Problem Sets	25 each (200 total)
Take-home Exercises	5 each (about 50 total)
Exam 1	100
Exam 2	150
Final Exam	200
Total	700 (subject to change)

- **Problem Sets.**

  Nine problem sets will be assigned during the semester, but only the *eight* top scores will be used to determine your final grade.

  The course calendar shows the schedule of assignments and due dates, which are subject to change. Hard copies of problem set solutions must be stapled together and left at the instructor's office by 5 pm on the due date.

  - Late homework will generally not be accepted. If there are extenuating circumstances, you should make prior arrangements with your instructor.
  - Your solutions should be clear and as precise as possible. Understandability of your answer is as desirable as correctness, because communication of technical material is an important skill.
  - A simple, direct analysis is worth more points than a convoluted one. Such analysis is simpler and less prone to error, and is easier to read and understand. Sloppy answers will receive fewer points, even if they are correct.
  - Make sure that your handwriting is legible. It is a good idea to re-copy your solutions before submitting them. This will ensure your work is neater and gives you a chance to do sanity checks and correct errors.

- **Exams.**

  Exam 1 is a closed-book, closed-note in-class exam, but you are allowed one, 8 x 11 sheet of paper, front and back, with notes.

  Exam 2 and final exam are take-home exams and should be completed entirely on your own. Please note that the lecture on which the exam is assigned constitutes part of the exam, and attendance is mandatory.

- **Take-home Exercises.**

  Between eight and ten take-home exercises will be assigned during the semester. Each of them is worth 5 points.

  These exercises will be handed out at the end of class. At the beginning of the next class, students just need to show their instructor that they have attempted to complete the exercises to receive full credit.

- **Collaboration.**

  The goal of the problem sets is to give you practice in mastering the course material. Consequently, you are encouraged to collaborate on problem sets. In fact, students who form study groups generally do better on exams than do students who work alone. If you are unable to solve a problem, talk to other students or ask your instructor.

  No collaboration is allowed on any of the course exams.

  Students should try to complete the take-home exercises on their own, but some collaboration is acceptable.

Important Dates:

Drop without "W" Deadline	Aug 31
First Exam	Sep 26
Drop with "W" Deadline	Oct 26
Second Exam Assigned	Nov 7
Final Exam Assigned	Dec 5