CSCI 280
Algorithms and Problem Solving Paradigms

Spring 2016
Lecture: MWF 8:10-9:00, MC Reynolds 317
Website: `http://ozark.hendrix.edu/~yorgey/280/`
Course text: Algorithm Design by Jon Kleinberg and Éva Tardos
`http://www.aw-bc.com/info/kleinberg/index.html`

Instructor: Brent Yorgey, MC Reynolds 310
Office hours: any time my door is open, or make an appointment at
`http://byorgey.youcanbook.me`
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Course Description

Introduction to algorithm design strategies that build upon data structures and programming techniques introduced in earlier courses. Strategies discussed include brute-force, divide-and-conquer, dynamic programming, problem reduction, and greedy algorithms. Topics covered include graph traversal and shortest paths, string matching, searching, sorting, and advanced data structures such as balanced search trees, heaps, hash tables, state machines, and union-find structures. The course includes an introduction to complexity theory and the complexity classes P and NP. Prerequisites: CSCI 151 and MATH 240.

List of topics

A rough outline of the semester is as follows:

- Introduction to Algorithms (3 lectures)
- Graphs (3 lectures)
- Greedy Algorithms (4 lectures)
- Divide and Conquer (3 lectures)
- Dynamic Programming (5 lectures)
- Network Flow (4 lectures)
- Randomization and Hashing (5 lectures)
- Strings (3 lectures)
- Intractability (3 lectures)

Evaluation

Evaluation will be based on

- 40%: Weekly problem sets. The lowest score will be dropped.
- 25%: Takehome midterm.
- 25%: Takehome, 24-hour, cumulative final.
- 10%: A class participation grade based on attendance, promptness, and participation in lecture.

Problem sets

The weekly problem sets, typically due **Friday at 4pm**, will collectively be worth 40% of your grade. The lowest problem set grade will be dropped.

Discussion and collaboration on the problem sets is encouraged. However, solutions must be written up individually. Copying another student's writeup, in whole or in part, or directly collaborating on a writeup, will be considered an academic integrity violation. **Insightful discussion with others must be cited in your homework solutions.** You will not lose points for such citations.

Each student has four late days to spend throughout the semester as they wish. Simply inform me any time *prior* to the due date for an assignment that you wish to use a late day; you may then turn in the assignment up to 24 hours late with no penalty. Multiple late days may be used on the same assignment.

There are no partial late days; turning in an assignment 2 hours late or 20 hours late will both use 1 late day.

Assignments must be turned in on physical paper. It is up to you whether you hand-write your solutions, or typeset them on a computer and print them. If you typeset them on a computer, I strongly encourage you to use LaTeX; I am happy to meet with you to help you get up to speed.

Each homework question will be graded on a 5 point scale, as follows:

- 5: The solution is clear and correct. This solution would easily find a home in a research paper.
- 4: The solution contains a few mistakes, but they are mostly arithmetic or of little significance to the overall argument.
- 3: The solution hits on the main points, but has at least one logical gap.
- 2: The solution contains several logical mistakes, but parts of it are salvageable.
- 1: The solution is just plain wrong.
- 0: No attempt is made at solving the problem.

You should not assume anything in particular about the correspondence between this 5-point scale and letter grades (other than the fact that the relationship is monotonic).

Midterm

The midterm will be takehome, and will be very similar to a problem set. You may only use your course notes, textbook, homework, and homework solutions; no collaboration is allowed.

The midterm will likely be the week after spring break. You will have three days to work on it.

Final

The precise format of the final exam will be announced as the end of the semester nears.

Attendance and submission policies

Prompt lecture attendance is expected. Although I typically do not take formal attendance, unexcused absences may be reflected in your class participation grade. If you must be absent for some reason, please let me know in advance.

If you are absent from lecture (whether excused or unexcused) it is **your responsibility** to obtain notes from other student(s). Do not come to me and ask "what did I miss?".[1] On the other hand, if after obtaining notes you have specific questions or confusions regarding the topics covered, I would be happy to talk with you.

Disabilities

It is the policy of Hendrix College to accommodate students with disabilities, pursuant to federal and state law. Students should contact Julie Brown in the Office of Academic Success (505.2954; `brownj@hendrix.edu`) to begin the accommodation process. Any student seeking accommodation in relation to a recognized disability should inform the instructor at the beginning of the course.

Academic Integrity

All Hendrix students must abide by the College's Academic Integrity Policy as well as the College's Computer Policy, both of which are outlined in the Student Handbook.

For specific ways the Academic Integrity policy applies in this course, please refer to the Computer Science Academic Integrity Policy.

The short version is that academic integrity violations such as copying code from another student or the Internet are **easy to detect**, will be **taken very seriously**, and carry a default recommended sanction of **failure in the course**.

If you have any questions about how the Academic Integrity policy applies in a particular situation, please contact me.

[1] I am likely to answer that you missed the part where that is your responsibility.