CSCI 332: Design and Analysis of Algorithms

Course information

Spring 2016
Meeting time: T/Th 2:10-3:30PM
Location: Liberal Arts 335
Final Exam: none

Course material/submissions/grades are in Moodle (http://umonline.umt.edu)

Instructor information

Instructor: Travis Wheeler
Office: Social Science 412
E-mail: travis.wheeler@umontana.edu
Phone: 406-243-6219
Office Hours:
  Mon 11:00-12:30 (SS 412): General office hours
  Wed 1:30-3:00 (SS 402): essentially an optional class session, driven by your questions
  Or by appointment (see schedule at http://wheelerlab.org/calendar)
  Sadly, I'm not available after class; I teach another class immediately after this one.

Teaching Assistant: Alex Nord
Office: Social Science 415
E-mail: alexander.nord@umontana.edu
Office Hours:
  Tue 12:30-2:00

Course Objectives

In this course, you will:

- Learn to reason formally about abstract processes of computation. This includes understanding and applying asymptotics (Big-O), recurrences, induction;
- Learn to relate and reduce real-world problems to abstract mathematical problems;
- Become fluent in standard techniques for designing algorithms (e.g., divide-and-conquer, dynamic programming, greedy algorithms)
- Learn and appreciate computer science's "greatest hits" algorithms.

Course Prerequisites

CSCI 232 & (M 225 or M 307). The course builds heavily on the material from these courses, so the prerequisites will be (mostly) enforced.

Required textbook

Introduction to Algorithms, Third Edition
By Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein

Other resources

- *Algorithms*, by Dasgupta, Papadimitriou, and Vazirani
  (a late draft pdf from 2006 can be found online with a simple search)
- https://www.khanacademy.org/computing/computer-science/algorithms
- Algorithm annotations: http://visualgo.net/

Tentative schedule (confirm in moodle)

Week	Content	Reading (CLRS)	Assignment (due)
Jan 25 – Jan 29	Intro Analysis of algorithms	1,2,3	
Feb 1 – Feb 5	Review data structures - arrays, lists, BST	10, 12.1-12.3, A.1, B.4, B.5 (skim all)	
Feb 8 – Feb 12	Hashing Divide and conquer	11.1-11.3, 4.1-4.5	HW 1 (Tue)
Feb 15 – Feb 19	Applications of sorting Heaps, heap sort Quicksort	6, 7	HW 2 (Thu)
Feb 22 – Feb 26	***No class Tuesday*** **Exam Thursday**		
Feb 29 – Mar 4	Linear Selection Dynamic Programming	9, 15	Prog 1 (Tue)
Mar 7 – Mar 11	Dynamic Programming Greedy algorithms	16.1-16.3	HW 3 (Thu)
Mar 14 – Mar 18	Graphs BFS, DFS, topological sort	22	
Mar 21 – Mar 25	Graphs (cont) SCCs, MST	23	Prog 2 (Tue)
Mar 28 – Apr 1	**Exam Tuesday** Shortest path	24.1-3	
Apr 4 – Apr 8	**Spring break**		
Apr 11 – Apr 15	NP completeness Reductions	34	HW 4 (Tue)
Apr 18 – Apr 22	Heuristics Branch and Bound	35 + TBD	Prog 3 (Thu)
Apr 25 – Apr 29	String matching Amortized analysis	32 + TBD + 17.1-17.4	
May 2 – May 6	Mystery **Exam Thursday**		HW 5 (Tue)

(TBD = to be determined)

Grading

Programming:	20%
Homework:	30%
Exams:	40%
“Daily” problems:	5%
Engagement:	5%

Grade cutoffs:

Determined based on my opinion of the work of students at the boundary.

Late policy

Submissions for programming and homework assignments are due at the beginning of class. Late submissions will not be accepted. Every student will get one free extension on an assignment (programming or homework) for up to a week. You do not have to ask for this – just write that you are using your free extension when you turn it in. Don’t waste this extension or feel obligated to use it; another extension will be given only in exceptional circumstances.

Exams

My exam strategy is as follows: all homework and exam problems will be drawn from the textbook, perhaps with minor modification. Thus the correct way to study for this course is to review these problems and figure out how to solve them. The more you work, the better your grade will be. Exams will be closed book.

Working in groups (homework)

The best way to learn the material is by solving problems. You are encouraged to work together - the best way to understand the subtleties of the homework problems is to argue about the answers. Each of you should look at all the problems independently, and not just divide the list in two parts each time. After discussing problems and coming up with solutions, you will each write up a separate submission. Though the ideas behind your solutions may be quite similar, the text should not be identical – demonstrate your command of the problem with a personalized solution. I retain the right to question you about the material turned in. If it is evident that you don’t understand what you turned in, your grade will be lowered.

(Don’t be a leech and let your partner do all the work. Unless you learn how to solve problems, you will get burned on the exams and thus for your final grade.)

Working in groups (programming assignments)

I encourage discussion with others regarding programming assignments, as well. As with homework, these should be high-level discussions. Code should be written independently. If I suspect copying or plagiarism, I will ask you to explain each piece of the code to me, possibly resulting in a reduced grade or removal from class.

Cheating

It should go without saying that academic dishonesty (including plagiarism and cheating) will not be tolerated. Consult the university's student conduct code for more details. I will follow the guidelines given there. I will seek out the maximum allowable penalty for any academic dishonesty that occurs in this course. If you have questions about which behaviors are acceptable, please ask me.

Disabilities

Students with disabilities are encouraged to meet with me to discuss *any* accommodations they require.

Electronic devices

Turn off your cellphone, or set it to vibrate during class. Take calls outside the classroom. Students texting during class will be asked to leave.

Personal contact

I hope to establish as much personal contact with each of you as is possible in a class this size. Don't be afraid to attend the "office hours" session, or stop by my office to ask questions or say hello. To facilitate interaction, every few weeks I plan to have a 'Pizza with the Prof'. Outside my office will be a sheet for you to sign-up to join 5-10 other students from the class for a pizza lunch (on me). I look forward to getting to know you.