CMSC 351: Algorithms

Spring 18

Instructor:

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Course Overview: This course presents an introduction to the techniques for designing efficient computer algorithms and analyzing their running times. General topics include asymptotics, solving summations and recurrences, algorithm design techniques, analysis of data structures, and introduction to NP-completeness.

Text: Thomas Cormen, Charles Leiserson, Ron Rivest, and Clifford Stein, *Introduction to Algorithms*, McGraw Hill and MIT Press. Any edition.

Prerequisites: Each student is expected to know the basic concepts of programming (e.g. loops, pointers, recursion), discrete mathematics (proof by induction, sets), simple data structures (lists, stacks, queues, trees), and calculus (logarithms, differentiation, integration).

Course Work and Exams: Course work will consist of written homework assignments, two midterm exams, and a final. You may discuss homework problems and general solution strategies with classmates, but you ***must*** write up the solutions yourself.

Homework assignments will be turned in on ELMS, https://www.elms.umd.edu/.

As a courtesy to the grader, homeworks are to be written clearly and neatly. Poorly written work will not be graded. When writing algorithms be sure not only that your solution is correct, but also that it is easy for the grader to understand why your solution is correct. Part of your grade will be based not only on correctness, but also on the simplicity, clarity, and elegance of your solutions.

If any of these exam dates are a problem for you, get in touch with Jamie Matthews now.

Piazza: We will be using Piazza (www.piazza.com), a question-and-answer system designed to streamline discussion outside of the classroom. It supports LaTeX, code formatting, embedding of images, and attaching of files. It will be moderated by the instructors and TAs, but students are encouraged to answer questions.

ELMS: We will be using ELMS to hand in assignments, get solutions, and to see grades.

Grading: Final grades will be based on the written assignments, two midterm exams, and final exam. The weights of these will be approximately 1% for each regular homework, 3% for the NP-completeness homework, 25% for each midterm, and 36% for the final exam.

Syllabus: This is the current version of the syllabus. The instructors reserve the right to change it at any time.

Topics: The following is a *tentative* list of topics and readings in *approximate* order.

1. Introduction, Ch. 1,2
2. Quadratic Sorting Algorithms, Ch. 2
3. Summations, Appendix A
4. Merge Sort, Ch. 2
5. Growth of Functions, Ch. 3
6. Recurrences (Integer Multiplication) Ch. 4
7. Heapsort, Ch. 6
8. Quicksort, Ch. 7
9. Sorting in Linear Time, Ch. 8
10. Medians and Order Statistics, Ch. 9
11. Graphs and Trees, Appendix B
12. Minimum Spanning Trees, Ch. 23
13. Dijkstra's algorithm, Ch. 24.3
14. Brief introduction to NP-completeness, Ch. 34