Course Information (DRAFT)

Welcome to CS526, graduate Algorithms. As a prerequisite, you should have already taken an undergraduate course in algorithms (such as CS323), a standard part of a Computer Science major. Such a course typically uses the Algorithms textbook by Cormen et al, or the one by Sedgewick, and it should cover basic search and graph algorithms, at least through minimum spanning trees (and often further topics, such as max-flow). If you do not have such a background, then you should consider taking CS523 (graduate Data Structures and Algorithms I) instead.

CS526 continues that kind of course, considering more advanced algorithmic examples. We continue to emphasize worst case and analytic results. In contrast to experimental fields like machine learning, we prefer algorithms that always work, on any possible input. We are interested in proving both their correctness and their efficiency. As part of this course, I’ll ask you to make and present such arguments.

This course is organized into two distinct halves, as follows:

First Half: The first half is lectures, about six weeks, plus an exam. I will review the core algorithmic curriculum, but adding examples that are typically not included at the undergraduate level. I want to cover (roughly) the following topics:

**Topic 1:** Divide and Conquer: FFT, the Master Theorem, separators.
**Topic 2:** Dynamic programming: MIS, treewidth, Baker’s PTAS.
**Topic 3:** Greed: from MST to matroids, set cover, Karger min-cut.
**Topic 4:** Optimization Reductions: max-flow to LP, min-cut to SDP.

For example “FFT” is the Fast Fourier Transform; it is a fairly simple divide-and-conquer algorithm but with some very important applications.

During this half of the course we’ll have (probably) three written homeworks, submitted via Canvas. The first half ends with a midterm exam, about a week after fall break. That exam is tentatively on **Wednesday, October 17**.

Second Half: The second half is a seminar, about 13 meetings. Possibly in groups, students will take turns presenting topics. We will start with some “classic” topics, and then move on to more recent research papers. This half of the course will be more advanced than the first half; our goal is to get some exposure to recent research. Besides making a presentation, each group should also prepare a online review of their topic, and try to answer any questions. We’ll use Canvas for that. This half of the course has no exam, but there may be some review assessments, just to keep you paying attention.

It is a good idea to think early about the topic you would like to present. I’ll be requesting topic proposals before fall break.
**Book and Rough Syllabus:** For the first half of the course, our main text is *Algorithms* by Dasgupta, Papadimitriou, and Vazirani (2006). This is a slim but advanced undergraduate algorithms text, reasonably suited for our review purposes. For the second half of the course we will use external materials, such as research papers, lecture notes, and monographs.

**Meetings:** We meet 1:00pm-2:15pm Mondays and Wednesdays in room W303. We will have a midterm exam, as described above. During the second half of the course, you will be part of a group that will make a topic presentation, and you are expected to attend the other presentations.

**Staff:** Your instructor (writing this) is Michelangelo Grigni. Contact me by e-mail at mgrign@emory.edu, or by phone at 7-7922. My office is room W426. My office hours will be posted on the web, and I am also available by appointment. I like talking to students, please come.

**Grading:** During the first half of the course there will be three written homeworks and midterm exam. In the second half, I’ll grade your presentation (and support documents), and I’ll also keep track of participation (attendance and interaction). Each graded item gets a mark in the range 0 to 100, curved so that the median is at least 85 (B). To get your final course average, I plan to take a weighted average of the marks, as follows:

- each homework gets a weight of one,
- the midterm exam gets a weight of three,
- your presentation gets a weight of two,
- your support documents get a weight of one,
- class participation (plus any quizzes) gets a weight of one.

**Online Support:** Our course page is [http://mathcs.emory.edu/~cs526001/](http://mathcs.emory.edu/~cs526001/) It should have handouts, and materials for each meeting (at least brief notes and blackboard images). We will use the Emory Canvas service for announcements, homework, and discussions.

**Policies:** If you miss an exam without prior arrangement, you need to arrange a medical excuse. Your work for this class is governed by the graduate school [Honor Code](http://mathcs.emory.edu/~cs526001/). Programming work is also covered by the Math/CS [SPCA](http://mathcs.emory.edu/~cs526001/) (Statement of Policy on Computer Assignments). In particular, you should take care to protect the confidentiality of your course-related work.