CMSC 651: Advanced Algorithms
Spring 2011

Course Information:  http://www.cs.umd.edu/class/spring2011/cmsc651/index.html

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Office hours: Mon, Wed 11-12.

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Office Hours: Tue 1:30–3:00 and Fri 2:00–3:30

Class Time: Mon Wed 3:30–4:45, Room: CSIC 3118.

Course Overview: Techniques for the design and analysis of algorithms and data structures. Study of efficient algorithms from areas such as graph theory, networks, scheduling etc. Understanding of the inherent complexity of problems: polynomial time, NP-completeness and approximation algorithms.

The following broad aims will be attempted.

- Understanding techniques to design and analyse data structures. These will find applications in combinatorial algorithms that we study.
- Learning and designing efficient algorithms for basic graph theoretic problems that are used as building blocks elsewhere. These include shortest paths, minimum spanning trees, matching, flow etc.
- An understanding of the inherent complexity of problems: Polynomial time, NP-completeness, Approximation Algorithms etc.

Texts: We will cover material from three books.

Cook, Cunningham, Pulleyblank and Schrijver, Combinatorial Optimization.

I will also make my lecture notes available on the home page for the class.

Prerequisites: CMSC 451 or an equivalent course.

Course Work: Course work will consist of a midterm, a final exam and homeworks.

Grading: The relative weights of these will be 25% for the homeworks, 35% for the midterm, and 40% for the final. Homeworks are to be done by yourself with no help from another person. All sources used must be cited.

Syllabus: The topics listed below give a general idea about the course content.

1. Advanced Data Structures (F-heaps, union-find).
2. Graph Algorithms (minimum spanning trees, shortest paths, light approximate shortest path trees, spanners, flows, matchings).
4. NP-completeness (Cook’s theorem, reductions).
5. Approximation Algorithms (set cover, vertex cover, bin packing, traveling salesman, optimal location problems).