CMSC 858K: Advanced Algorithms

Spring 1997

Course Information: *http://www.cs.umd.edu/~samir/858/858.html*

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Office hours: Tues 2-3 and by appointment.

Class Time: Tu Th, 3.30–4.45, Room: CSS 2330.

Teaching Assistant:

Course Overview: The main paradigm in the course will be the design and analysis of approximation algorithms. A majority of the problems considered will be graph theoretic. I expect that the students are already familiar with the material from CMSC 451 (minimum spanning trees, shortest paths, dynamic programming, NP-completeness etc.).

The following broad aims will be attempted.

- Learning and designing efficient algorithms for basic graph theoretic problems that are used as building blocks elsewhere. These include matching, flow, min cost flows etc.
- An understanding of the inherent complexity of problems: Polynomial time, NP-completeness, Approximation Algorithms etc. We will spend at least half (or more) of the semester studying techniques for designing approximation algorithms.

Texts: Robert Tarjan, *Data Structures and Network Algorithms*, SIAM, 1983.

Dorit Hochbaum (editor), *Approximation Algorithms for NP–hard problems*, PWS publishing company (1996).

I will also make my lecture notes available on the home page for the class. I will expect the students to help me with the notes for the class (especially on approximation algorithms).

Prerequisites: CMSC 451 or an equivalent course.

Course Work: Course work will consist of a midterm exam (about 50% of your grade) and a **choice** of a project or a comprehensive final (about 40% of your grade). For students interested in doing research, the project is the recommended option. You will be required to prepare typeset lecture notes for one or two lectures.

Projects could range from doing a comprehensive implementation comparing various approximation algorithms, coming up with new proofs/algorithms for existing results, obtaining new research results etc. You should talk to me about the possible project before spring break. I expect a fair amount of innovation from the student in defining the project. I will be happy to provide references that you can follow.

If you cannot come to class, please ask a friend to pick up copies of handouts from you. **It is your responsibility to make sure that you pick up all handouts.**

Grading: Final grades will be based on the project/lecture notes and the final exam. The relative weights of these will be 10% for the lecture notes, 50% for the midterm exam, and 40% for the project/final.

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

1. Advanced Combinatorial Algorithms.
2. Approximation Algorithms for NP-hard problems.