ORIE 6334 Approximation Algorithms

Course Information

January 28, 2014

1 Instructor Information

Instructor:	David Williamson
Office:	Rhodes 236
Office hours:	Mondays 1:30-2:30, Wednesdays 11-12, and by appointment.
Office phone:	255-4883
Email:	`dpw@cs.cornell.edu`

2 Lectures

Lectures will be held in Rhodes 253 on Tuesdays and Thursdays from 1:25-2:40.

3 Course website

The course website will be at `www.orie.cornell.edu/~dpw/orie6334/index.html`. Various materials from the course will be posted there.

4 Prerequisites

There is no formal prerequisite. In practice, I will be assuming some previous exposure either to algorithms or combinatorial optimization, and some ability to do mathematical proofs. If you've had a good undergraduate algorithms class that had proofs about the algorithms, you should be set. Please talk to me if you have questions about whether you have the necessary background.

5 Textbooks

The required text is "The Design of Approximation Algorithms", published by Cambridge University Press. Copies are available at the campus bookstore. We also make an electronic version available at `www.designofapproxalgs.com`.

I will offer $1 to any course participant per bug or typo found in the book. The bug/typo cannot have been previously found by someone else.

Some other books that might be useful:

- Vijay V. Vazirani, *Approximation Algorithms*, Springer, 2004. A good text.
- Bernhard Korte and Jens Vygen, *Combinatorial Optimization*, 5th edition, Springer, 2012. A reasonably good-sized section on approximation algorithms with some material not covered by Vazirani.

- Dorit S. Hochbaum, editor, *Approximation Algorithms for NP-hard Problems*, PWS Publishing Company, Boston, 1997. A collection of surveys. Now quite dated, but some surveys are still good.

6 Requirements

There will be 4 to 5 problem sets, handed out and collected on a biweekly basis. In addition, there will be a take-home final, which will count for somewhat more than a problem set.

7 Collaboration

Cornell's Code of Academic Integrity can be found at `cuinfo.cornell.edu/Academic/AIC.html`.

Your work on problem sets and exams should be your own. You may discuss approaches to problems with other students, but as a general guideline, such discussions may not involve taking notes. You must write up solutions on your own independently, and acknowledge anyone with whom you discussed the problem by writing their names on your problem set. You may not use papers or books or other sources (e.g. material from the web) to help obtain your solution.

No collaboration will be allowed for the take-home final.

8 Schedule

Here is a rough schedule for the course, which will is subject to change without notice. Depending on the background of the class, I may go either faster or slower than this schedule indicates.

Jan	28, 30	Introduction to approximation algorithms: Set cover. Facility location. Problem set 1 out.
Feb	4, 6	Intro: Facility location. Greedy algorithms and local search: Submodular function maximization.
Feb	11, 13	Greedy algorithms and local search: Submodular function maximization. Min-degree spanning trees. Problem set 1 due. Problem set 2 out.
Feb	18	No class (February break).
Feb	20	Rounding data and dynamic programming: Knapsack. Independent set in planar graphs.
Feb	25, 27	Random sampling and randomized LP rounding: MAX SAT. Prize-collecting Steiner tree. Steiner tree. Problem set 2 due. Problem set 3 out.
March	4, 6	Semidefinite programming: MAX CUT. Coloring 3-colorable graphs.
March	11, 13	Primal-dual method: Generalized Steiner tree. k-median via Lagrangean relaxation.
March	18, 20	Cuts and metrics: Multiway cut. Multicut. Problem set 3 due. Problem set 4 out.
March	25, 27	Cuts and metrics: Tree metrics.
April	1, 3	No class (spring break).
April	8, 10	Deterministic LP rounding revisited: Min-cost bounded-degree spanning tree. Survivable network design. Problem set 4 due. Problem set 5 out.
April	15, 17	Advanced topics TBD.
April	22, 24	Advanced topics TBD. Problem set 5 due.
April	29	Advanced topics TBD.
May	1	
May	6	Open questions and course wrapup. Take-home exam out (tentative).
May	12	Take-home exam due (tentative).

9 Your information

Please fill out the information below and return it by the end of the lecture.

Name _____

Net ID _____ Preferred email address _____

Major _____ Year _____

Are you taking this class for credit? ____

I have studied the following subjects:

____ Linear programming
____ Algorithms
____ Combinatorial optimization
____ Complexity theory (including NP-completeness)
____ Linear algebra
____ Combinatorics and/or graph theory

I have already studied some amount of approximation algorithms (Yes/No; if Yes, how much, what topics):