UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
DEPARTMENT OF MATHEMATICS
COURSE DESCRIPTION — SPRING 2013
MATH 482 — LINEAR PROGRAMMING

Lecture: 11am MWF, 443 Altgeld Hall. **Instructor:** D. Stolee (stolee@illinois.edu)
Office: 226 Illini Hall, Hours 1:00-3:00 MW or by appointment.

This course studies mathematical aspects of problems in linear and integral optimization that are relevant in computer science and operation research. It is based on the book *Combinatorial Optimization: Algorithms and Complexity* by C. Papadimitriou and K. Steiglitz. Other handouts will be used for certain topics.

We start by describing and analyzing the simplex algorithm for linear programming. Next we discuss the geometric concepts underlying the algorithm and start the main theme of the course — duality. Using this idea we give some modifications of the simplex method and analyze their computational aspects.

We introduce the primal–dual algorithm and show what its variations can do for basic problems of combinatorial optimization: the shortest path problem, the max-flow problem, the min-cost flow problem. Then we discuss some applications of the above material to matrix games, combinatorial min-max theorems, and matroids. After that, we describe what can be done for integer linear programs (such as traveling salesman problem or scheduling problems). If time allows, we will introduce and discuss the notion of **NP**-complete problems.

The course grading will be based on a collection of homework assignments which range from hand-computations, proofs, and computer assignments (such as using software to solve a linear program). Homeworks will be assigned and due ever 2–3 weeks. There will be two 2-hour evening midterms during the weeks of March 4 and April 22 (exact times will be scheduled in the first week of classes), and a comprehensive make-up midterm exam during the week of April 29. There will also be a three-hour final exam at 7:00–10:00PM, Monday, May 6.

Weighting: Homework 150pts, Tests 100+100pts, Final Exam 150pts, Total 500pts.

Resources: Electronic mail is a medium for announcements and questions. Copies of homework assignments and some other material will be on the web at http://www.math.uiuc.edu/~stolee/482/.

Prerequisite: Math 315 or equivalent

Textbook: *Combinatorial Optimization: Algorithms and Complexity* by C. Papadimitriou and K. Steiglitz.

Special Circumstances: If you have a circumstance that prevents you from performing to your utmost capacity in this class, such as a learning disorder or physical handicap, contact the division of Disability Resources and Educational Services (http://www.disability.illinois.edu/).

The instructor reserves the right to modify this course.