University of Southern California
Daniel J. Epstein Department of Industrial and Systems Engineering
ISE 536: Linear Programming and Extensions – Fall 2007
Course Syllabus

Instructor: Fernando Ordóñez
GER - 203 (213) 821-2413 fordon@usc.edu
Office Hours: Right after class — 11:15 -12:15 Monday-Wednesdays

General:
The course meets Mondays and Wednesdays, 10:00 -11:15 at KAP-166. Handouts will be posted at the Blackboard website (http://totale.usc.edu)

Course Text:
Dimitris Bertsimas and John Tsitsiklis *Introduction to Linear Optimization*, Athena Scientific 1997.

Course Objectives:
The course is a graduate-level subject in the theory and practice of linear programming. The course will review the essential properties and geometry of linear programs, present modeling techniques, discuss the efficient solution methodologies, and introduce current research topics in linear programming.

The objective is to introduce students to linear programming tools, which will enable them to model and solve real systems, and analyze and develop algorithms.

Prerequisites:
MATH 225, Linear Algebra and Linear Differential Equations or
EE 441, Applied Linear Algebra for Engineering or
Departmental approval

Grading:
The course will have almost weekly problem sets, which will consist of problems from the text and on occasion a few computational exercises. Computational exercises will be carried out using the NEOS Server for Optimization (http://www-neos.mcs.anl.gov/). The homeworks will be graded on a random subset of the problems, but solutions to all problems will be posted in the course's web-page. The course will also have two midterms and a final exam. The grading for the class will be determined using the following weights, homework: 30%, each midterm: 20%, and final: 30%.

Academic integrity: "The Department of Industrial and Systems Engineering adheres to the University's policies and procedures governing academic integrity as described in SCampus. Students are expected to be aware of and to observe the academic integrity

standards described in SCampus, and to expect those standards to be enforced in this course."

"Any Student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m. - 5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776."

Tentative Course Outline:

1. Introduction (2 lectures)
- Examples of Linear Programming (LP), Transformations and Equivalent LPs, Graphic Solution of LPs

2. Geometry of LP (3 lectures)
- Basic Feasible Solutions (BFS), Degeneracy

3. Simplex Method (4 lectures)
- Algorithm, Phase I, Column Geometry, Complexity of Simplex Method

4. LP Duality (4 lectures)
- Dual Problem, Dual Simplex, Farkas Lemma, General Duality

5. Sensitivity Analysis (4 lectures)
- Local Sensitivity Analysis, Global Dependency on Right-Hand Side b, Global Dependency on Cost Vector c

6. Large Scale Linear Programming (4 lectures)
- Column Generation, Cutting Plane Methods, Dantzig-Wolfe, Benders Decomposition (for Stochastic Programming)

7. Integer Programming (3 lectures)
- Modelling, Branch and Bound

8. Complexity of LP (2 lectures)
- Examples, Ellipsoid Algorithm, Interior Point Methods (IPM): Primal Path Following, Primal-Dual Path Following

Tentative Assignment Schedule:

Class	Date	Assignment	Reading
1	Aug 27		1.1- 1.6
2	Aug 29		
3	Sep 5		2.1 - 2.6
4	Sep 10	PS #1 due	
5	Sep 12		
6	Sep 17	PS #2 due	3.1 - 3.6
7	Sep 19		
8	Sep 24	PS #3 due	
9	Sep 26		
10	Oct 1	**Midterm 1**	
11	Oct 3		4.1 - 4.9
12	Oct 8	PS #4 due	
13	Oct 10		
14	Oct 15	PS #5 due	
15	Oct 17		5.1, 5.2, 5.4
16	Oct 22	PS #6 due	
17	Oct 24		
18	Oct 29	PS #7 due	
19	Oct 31		6.1 - 6.6
20	Nov 5	**Midterm 2**	
21	Nov 7		
22	Nov 12	PS #8 due	
23	Nov 14		
24	Nov 19	PS #9 due	10.1, 10.2, 11.1, 11.2
25	Nov 21		
26	Nov 26	PS #10 due	
27	Nov 28		8.1, 8.3, 9.4, 9.5
28	Dec 3	PS #11 due	
29	Dec 5		
30	Dec 17	**Final Exam**	8:00-10:00 a.m.