Math 461 – Linear Programming
Fall 2002

Instructor: Dr. Brian Heck
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Office Hours: MWF 8:30-9:30; 11:30-2:30
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Prerequisite: Math 360.
Text: Elementary Linear Programming with Applications (2^{nd} ed.) by Kolman/Beck (Acad. Press)

Course Description (catalog): Geometry of linear programming; matrix notations; extreme point theorem; basic solutions; the simplex method; slack, excess, and artificial variables; duality; sensitivity analysis; integer programming with applications.

Course Description (instructor): During World War II, George Dantzig worked for the United States Air Force as an applied mathematician. His job was to determine the most efficient method for (1) transporting troops and supplies to where they were needed, (2) scheduling of training, and (3) allocating resources. He formulated these problems as systems of linear equations. Once the war ended, he set out to generalize his work. In 1947, he developed the Simplex Method, and the world has never been the same.

Linear Programming (LP) is the branch of mathematics that deals with optimizing linear functions of several variables subject to multiple constraints. It falls under the applied mathematics field of Operations Research. The work of Dantzig and those who followed him is now widely used in business, economics, engineering, computer science, and the military. It could be argued that it ranks among the most significant mathematical achievements of the 20^{th} century… and in a century which saw the solutions to such classical problems as the Four Color Theorem and Fermat's Last Theorem, as well as the birth of important fields such as algebraic topology, logic, set theory, and group theory…that's saying something.

We will begin the semester with a thorough description of LP problems. While in two dimensions visualization will be useful, we will quickly discover the need for abstraction. The Simplex Method will be introduced next, and we will use it to solve a wide variety of LP problems. Finally, we will study the Dual Simplex Method, the Revised Simplex Method, Integer Programming and tackle network flows, as time allows.

Course Objectives: At the successful completion of this course, a student will be able to:

- describe complex real-world problems using mathematical modeling
- visualize problems, and their solutions, involving two variables
- translate mathematical formulations of problems into different forms
- solve LP problems using various tools such as slack and excess variables, the simplex method, duality, networks and more
- explain the strengths and weaknesses of the various methods for solving LP problems

- interpret the solutions generated by the various methods of solving LP problems and formulate practical solutions to the real-world problem
- utilize the available computer software to aid in the solving of LP problems
- solve network flow problems using the various methods

Grading Policy: Tests (4): 80%
Final Exam: 20%

We will use the standard 10-point scale. A=90-100%, B=80-89%, etc…. The final exam is comprehensive and (semi) optional. If you are pleased with your grade (A, B, or C) prior to the final, you may elect not to take it. However, if you do elect to take the final, it *will* count. If your grade is less than a C, or you have previously missed an exam, you must take the final.

Attendance: I will not include attendance as part of your course grade. I am not your mother or your parole officer, and this is not high school. I do, however, expect you to attend class everyday. You are responsible for all material covered in class.

Approximate Class Schedule: Below is a list of the sections we will attempt to cover this semester. If time allows, more sections may be added. If time does not allow, some sections may be skipped.

Chapter 1: Sections 1-5
****Test #1...Friday, September 13**** ***Superstition Buster Special!!***

Chapter 2: Sections 1-3
****Test #2...Monday, September 30****

Chapter 3: Sections 1-6
****Test #3...Friday, October 25****

Chapter 4: Sections 1-3
Chapter 5: Sections 1-6
****Test #4...Monday, November 25****

*****Final Exam...TBA*****

Closing Remarks: It is assumed that you are attending this university because you have a desire for higher learning. It is therefore expected that you will pay attention, be respectful of your instructor and fellow students, and follow the Code of Student Conduct. Instances of academic dishonesty will be dealt with severely. If you are caught cheating, you will fail this course. Similarly, if you are a disruptive presence in the classroom, you will be dropped from the class.

Important Dates:
Final Date To Drop Courses With a "W" **– Monday, November 4, 2002**