Linear Programming
(Introduction to Mathematical Programming)
BMGT830
Fall 2019

Instructor: Dr. S. (Raghu) Raghavan
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The Robert H. Smith School of Business & Institute for Systems Research

Office Hours: Monday through Thursday 2:00 – 3:00 pm.

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Support Person: Ms. Janet Cavanaugh, 301-405-2206 (VMH 4363).

TA: TBD.

Prerequisites: I expect you to have a good (undergraduate) mathematical background (especially with matrices and some familiarity with linear algebra). I also expect you to be familiar with simple logic and proof techniques.

Textbooks:
Required (i.e., official text):
Introduction to Linear Optimization by Dimitris Bertsimas and John Tsitsiklis.
Recommended Books/Other References:
Linear Programming by Vasek Chvatal (out of print, may find used or new copies on amazon.com)
Applied Mathematical Programming by Bradley, Hax, and Magnanti (out of print. available online at http://web.mit.edu/15.053/www/)
Model Building in Mathematical Programming by H. Paul Williams
Additional supplementary material will also be handed out regularly.

Class Hours: Tuesdays & Thursdays 12:30 p.m. to 1:45 p m..

Course summary:
This course will serve as a **graduate** level introduction to mathematical programming to students in engineering, applied mathematics, and the business school, with an emphasis on techniques for the solution and analysis of linear optimization models. It covers the classical theory of linear programming. Topics covered include: the simplex method, duality theory, sensitivity analysis, decomposition methods, network simplex, introduction to integer programming and nonlinear optimization, modeling languages and the use of high-end optimization packages for linear optimization. On completing this course, the student (1) will have the necessary background to undertake more advanced courses in this area (integer programming, network optimization, nonlinear optimization) (2) and pursue research in any mathematical programming *application* area (e.g., transportation, manufacturing, network design, supply chain optimization).

Requirements:

Homeworks	30%
2 Quizzes (closed book)	30%
Final exam (open book)	40%

Homework:
Homework will be assigned on a regular basis and will count for 30% of the grade. Homeworks will cover a variety of problems, including formulations, as well as theoretical questions requiring proofs. You may discuss homeworks with each other, and work collaboratively to solve them. However, you are responsible for writing up the answers by *yourself*. Further if you have worked collaboratively on a problem, you need to write down the names of the individuals you worked with on the problem. Late homework will normally not be accepted.

Exams:
There will be 2 quizzes and a final exam. The quizzes are designed to be short closed book exams, to test the concepts developed in class. These will contribute to 30% of the grade. To maximize contact hours, it is possible that the quizzes may be held at a mutually agreeable time outside the scheduled class time. The final exam in this course will be a comprehensive one (i.e., cover all of the material covered in the semester), and is scheduled during finals week. This will count for 40 % of the grade.

Course web site:
The course website is located at http://elms.umd.edu. For each registered student your login and password are your UM ID and password. The course will be a repository for the course handouts.

Attendance:
You are expected to attend each class. Frequent absence has a negative effect on your learning as well as your course grade. If you miss a class session, you are responsible for all the material covered in that session. You may pick up a copy of the handouts for a class (if any) by going to the course web page. Additionally, you may wish to request a fellow student for their notes from the class.

Academic Integrity:
The University's Code of Academic Integrity is designed to ensure that the principles of academic honesty and integrity are upheld. All students are expected to adhere to this Code. The Smith School does not tolerate academic dishonesty. All acts of academic dishonesty will be dealt with in accordance with the provisions of this code. Please visit the following website for more information on the University's Code of Academic Integrity: http://shc.umd.edu

On each exam or assignment you will be asked to write out and sign the following pledge. "I pledge on my honor that I have not given or received any unauthorized assistance on this exam/assignment."

Approximate Outline of Topics Covered

1. Introduction and Overview
2. Formulations: Tips, tricks and techniques.
3. Simplex Method
4. Review of Linear Algebra
5. Revised Simplex
6. Sensitivity Analysis
7. Duality Theory
8. Modeling Languages and Commercial Linear Programming Optimization Codes
9. Convexity and Polytopes
10. Network Flow Models
11. Integer Programming
12. Dantzig-Wolfe Decomposition
13. Introduction to Nonlinear Programming
14. Applications and Research Projects

Special Needs: Any student with special needs should bring this to the attention of the instructor as soon as possible, but not later than the second week of class.