ISyE 6669, Deterministic Optimization
(as seen in *Sports Illustrated*)

IMPORTANT INFORMATION

Meeting Times: MWF 1-2 pm, SST 1

Instructor: Joel Sokol
Office: ISyE Room 418
Office Hour: W 2:00-3:00 or by appointment, or just drop in.
Email: jsokol@isye.gatech.edu
Phone: (404) 894-6484 (office) – Note: Sometimes I forget to check my voicemail, so if you leave a message, please also send me an email.

Teaching Assistant: TBA

Prerequisites: ISYE 4231 (Engineering Optimization) or equivalent. *This is a REAL prerequisite!* I expect that you will have a basic familiarity with many of the topics listed below in the course outline, including all topics listed with an asterisk (*). We will cover these topics in review-mode only; that is, we will see them quickly to refresh your memory, but too quickly for you to learn for the first time. If you have taken the prerequisite course but are not familiar with one or more of these topics, please see me ASAP, before it is too late.

Textbook: Wayne L. Winston, *Operations Research*, 3rd edition. (*Introduction to Mathematical Programming* by the same author is an acceptable substitute; any students using this textbook will be responsible for determining the corresponding pages of readings, homework problems, etc.)

- Note: This course will also cover some material not in the textbook, and not all material in the book will be covered in the course.

Web Site: Throughout the semester, course materials (handouts, homework, solutions, etc.) may be posted at http://www.isye.gatech.edu/~jsokol/6669/

COURSE OUTLINE

*Modeling real-life situations as optimization problems
*Linear programming
  * Assumptions
  * Graphical solution
  Algorithmic solution (Simplex)
  Degeneracy and cycling
  * Software solution
  * Sensitivity analysis/understanding what the software tells you
  Duality and its uses
  Dual Simplex
  Inverse optimization

Network flow problems
  * Network terminology and definitions
  * Uses and modeling techniques
  Solution methods
  Integrality property
*Special types of network problems  
Recognizing easy network problems  
Recognizing problems that are not easy network problems

Analysis of algorithms  
Big-O notation  
Operation counts  
P, NP, and complexity  
Proving NP-completeness

Integer programming  
*Modeling with integer variables  
*Branch-and-bound  
Strong and weak formulations

Nonlinear programming  
Easy and hard problems  
Local and global optima  
General improvement algorithms

• Listings with an asterisk (*) are topics that I expect you to have some familiarity with from the prerequisite course.

CLASS PROCEDURES

“One who is too strict is not a good teacher…”

Homework should be turned in in a timely manner. However, my first priority is that you learn the material. If, occasionally, you feel that you would learn more given another day or two, I will certainly grant you an extension.

“…and a student who is too quiet will never fully learn.”

If there’s anything you don’t understand in class, please ask right away. You don’t even need to raise your hand – just yell out your question if I’m not looking in your direction. I’m always happy to answer any of your questions. It’s important that you understand everything I say; otherwise, you’ll be lost when we go on.

GRADING POLICY

Homework: Homework is meant to be a learning tool. If you are having trouble, find help right away – don’t wait until you fall even further behind! Good sources of help are fellow students, the teaching assistant, and me.  
• I encourage you to attempt each homework on your own, and then get together with other students to compare your approaches.

Course Project: The course project will be due at the end of the semester. Details will be handed out within the first few weeks of the course.
Exams: There will be two in-class midterm exams, plus a cumulative final exam. The exact dates of the midterms will depend on the pace of the course, and will be announced later. The final exam will be given according to the Georgia Tech finals-week schedule. Exams may contain a take-home component.

Grading: Course grades will be calculated according to the following formula:
- Homework 10%
- Exams 70% (total)
- Course Project 20%

Makeups: In general, there will be no makeup exams given. If you must miss an exam for any Institute-approved reason, please let me know as far in advance as possible.

HONOR CODE

All course participants (myself, teaching assistants, and students) are expected and required to abide by the letter and the spirit of the Georgia Tech honor code. If there is any way in which I can help you in complying with the honor code, please do not hesitate to ask. I will do the same.

• I’m very serious about this. Ethical behavior is extremely important in all facets of life.
ISyE 6669A & Q, Deterministic Optimization  
Homework Assignment #1

Due by midnight on Sunday, August 26th

Briefly (1 or 2 sentences each) answer the following questions.
• Email all responses to jsokol@isye.gatech.edu

Name
Section – A (in person) or Q (video)? If Q, where do you live?
Department
Expected Area of Concentration (MSIE, MSOR, etc.)
Previous Degree(s):

Why are you taking this course?

What do you hope to learn from this course?

Have you seen any of the material the covered by the course before?

Have you taken the prerequisite course or its equivalent?

What are your professional interests and career plans?

(Optional) What are some of your outside interests/activities?

• This is a real (graded) homework assignment! You will receive full credit for answering the questions (no matter what answers you give), and zero credit if you do not answer the questions.

SAMPLE RESPONSE

Name      Joel Sokol
Section   Both A and Q, and I live in Atlanta, GA.
Dep’t     ISyE
Areas     Optimization, Logistics
Degrees   Ph.D. in Operations Research (MIT), B.S. in Applied Sciences in Engineering (Rutgers), B.A. in Mathematics and Computer Science (Rutgers)

Why are you taking this course? I like the material it covers, and I use it in almost all of my research.
What do you hope to learn from this course? That teaching a class with video students is just as much fun as teaching a regular course.
Have you seen any of the material covered by the course before? Yes, all of it.
Have you taken the prerequisite course or its equivalent? Yes – in fact, the Rutgers equivalent of ISyE 4231 is the course that convinced me to go into this field!
What are your professional interests and career plans? I’m interested in applying optimization to solve problems in network design, logistics, sports, biology, and many other areas. My career plan is to remain a professor.
(Optional) What are some of your outside interests/activities? Sports, music, travel, and general knowledge/philosophy.