OR 541: Deterministic Models
Spring 2020
James Buchanan Hall D003
Jan 21, 2020 - May 13, 2020
Monday 7:20-10:00 PM

Professor: Dr. Ronald F. A. Woodaman
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Office: Room 2248, Nguyen Engineering Building
Office hours: Monday 4:30-6:30 PM; by appointment please.
Prerequisite: Linear Algebra
Textbook: *Operations Research Applications and Algorithms*, Wayne L. Winston (4th edition)
Software: MS Excel and Python/PuLP (https://pythonhosted.org/PuLP/)
Course Materials: BlackBoard

Philosophy: *Make it real.* I spent 20 years in the Marine Corps: half in the infantry, the other half doing operations research. Since retiring in 2007, I have attacked some of the hardest problems in DoD, from counter-IED to suicide prevention, gaining practical experience in the breadth of OR methods. Thus, my approach is to cover the requisite material and make it *interesting, practical, and holistic*. Good OR engages not just your technical skills but your creative and communicative skills.

Objectives: We introduce the basic mathematical ideas and method of Deterministic Operations Research; i.e., mathematical optimization. We will discuss modeling real life problems, and show how to develop, solve, and interpret a variety of deterministic optimization models. Students will gain experience in converting a variety of applied problems to optimization models, representing these models in a sophisticated modeling language, solving these models with a variety of algorithms and software, and interpreting the results using sensitivity analysis and other approaches.

Main Goal: To improve decision-making with operations principles and methods, specifically:
- To learn about the core operations research methods for optimization and how to apply them in the real world.
- To learn about the role of uncertainty and use of data in decision-making.
- To learn to communicate effectively.

Homework and Grading:
- Homework problems are assigned after most lectures session for submission at next class.
- There will be one individual optimization project that will require oral presentation.
- Late work will only be accepted where prior arrangement has been made with the instructor.
- All tests are open book, open notes.

Grades will be computed as follows:
- Homework: 10% (not graded; collaboration encouraged; copying teaches you nothing)
- Midterm: 30%
- Project: 30%
- Final: 30%

Tentative Course Schedule: Subject to change. It is the responsibility of the student to know the schedule – changes posted on BlackBoard or via email announcements.

Date	***Topic: Chapters***
1/27	Introduction: 1, Linear Programming: 3.1 – 3.2
2/3	Linear Programming 3.3 – 3.9
2/10	The Simplex Method 4.1 – 4.5
2/17	The Simplex Method 4.6 – 4.8, 4.12 – 4.13
2/24	Sensitivity Analysis & Duality 6.1 – 6.3
3/2	Sensitivity Analysis & Duality 6.5 – 6.10
3/9	**SPRING BREAK**
3/16	Formulations with PuLP: use of Indices, Loops, etc.
3/23	In class exam – covers through sensitivity analysis/duality
3/30	Intro to Networks 8.1 – 8.3, Network Simplex Method 8.6 – 8.7
4/6	Integer Programming 9.1 – 9.3, 9.5
4/13	Integer Programming 9.7
4/20	Nonlinear Programming 11.1 – 11.4, 11.6
4/27	Nonlinear Programming 11.8 – 10
5/4	Project Presentations and review for Final Exam
5/11	Final Exam (7:30-10:15pm) (Tentative)

Online participation

All lectures are conducted live on Collaborate Ultra and are recorded. So while this class includes both in-class and online sections, I am more than happy to have the in-class persons use Collaborate Ultra when unable to attend class.

Tests for the online folks are conducted concurrently. They are available for download 5 minutes before test time and then must be uploaded within 10 minutes of end time. You will need access to a printer and the ability to upload your tests. In the past, folks have even used their phones… but if the images are poor, it does not stimulate merciful grading.

University Policies

Honor Code:

GMU is an Honor Code university; please see the Office for Academic Integrity for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely. What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone else's work in an aspect of the performance of that task, you will give full credit in the proper, accepted form. Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt (of any kind) please ask for guidance and clarification.

Disability Accommodations:

If you have a learning or physical difference that may affect your academic work, you will need to furnish appropriate documentation to the Office of Disability Services. If you qualify for

accommodation, the ODS staff will give you a form detailing appropriate accommodations for your instructor. In addition to providing your professors with the appropriate form, please take the initiative to discuss accommodation with them at the beginning of the semester and as needed during the term. Because of the range of learning differences, faculty members need to learn from you the most effective ways to assist you. If you have contacted the Office of Disability Services and are waiting to hear from a counselor, please tell me.

Email:
Students must use their MasonLive email account to receive important University information, including messages related to this class. See http://masonlive.gmu.edu for more information.
You will need an email account to get all notices that are posted on mymason.gmu.edu (Blackboard).