

# ORMATH 441: Deterministic Operations Research

*Spring 2011*

*Innovation Hall, room 136*

*Tuesdays and Thursdays, 10:30-11:45am*

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Office hours: **Tuesdays 2-4pm, and by appointment; via e-mail at other times**

Prerequisite: MATH 203

All course materials will be posted at <http://mymason.gmu.edu>

Textbook: *Operations Research Applications and Algorithms*, Wayne L. Winston (4<sup>th</sup> edition)  
Software: *MPL*, available from [www.maximal-usa.com](http://www.maximal-usa.com)

Overview: This course will introduce the basic mathematical ideas and methods of Deterministic Operations Research. We will discuss modeling real life problems, the basic concepts of Linear Programming (LP), and methods for solving LP problems. We are going to discuss briefly some concepts of nonlinear optimization and their applications. There will be a project, which requires modeling real life problems using MPL languages available for downloading from the Internet ([www.maximal-usa.com](http://www.maximal-usa.com)).

## Tentative Course Schedule

<i>Date</i>	<i>Topic</i>	<i>Chapters</i>
8/30	Introduction to Operations Research	1
9/1	Linear Programming (I)	3.1-3.2
9/6	Linear Programming (II)	3.3-3.4
9/8	Linear Programming (III)	3.5-3.9
9/13	The Simplex Method (I)	4.1-4.2
9/15	The Simplex Method (II)	4.5
9/20	The Simplex Method (III)	4.6-4.8
9/22	The Simplex Method (IV)	4.12
9/27	Review for First Midterm	
9/29	<i>First Midterm Exam</i>	
10/4	Sensitivity Analysis & Duality (I)	6.1-6.2
10/6	Sensitivity Analysis & Duality (II)	6.3
10/11	Sensitivity Analysis & Duality (III)	6.5-6.7
10/13	Sensitivity Analysis & Duality (IV)	6.8-6.9
10/18	The Transportation Problem (I)	7.1
10/20	The Transportation Problem (II)	7.2
10/25	Networks (I)	8.1-8.2

10/27	Networks (II)	8.3, 8.6
11/1	Integer Programming (I)	9.1-9.2
11/3	Integer Programming (II)	9.3
11/8	Integer Programming (III)	9.5
11/10	Integer Programming (IV)	9.7
11/15	<i>Second Midterm Exam</i>	
11/17	Nonlinear Programming (I)	11.1-11.3
11/22	Nonlinear Programming (II)	11.4, 11.6
11/24	THANKSGIVING	
11/29	Nonlinear Programming (III)	11.8
12/1	Nonlinear Programming (IV)	11.9
12/3	Nonlinear Programming (V)	11.10
12/8	Review	
12/15	<i>Final Exam (10:30am-1:15pm)</i>	

<b>Grading:</b>	25%	Homework
	25%	Midterm exam
	15%	Computational project
	35%	Final exam

### **Main Goals:**

- This course covers fundamental methods of optimization with a focus on linear, network, and integer linear and nonlinear programming models.
- Students are expected to be able to:
  - Formulate basic optimization problems and solve them using a modeling language.
  - Understand and be able to apply the simplex method to solve linear models.
  - Understand how sensitivity analysis can be used to evaluate the effects of uncertainty in decision-making.
  - Understand and be able to apply branch and bound methods to integer linear models.
  - Understand and be able to apply network algorithms.
  - Understand the basic methods of nonlinear optimization: Be able to apply the Kuhn-tucker conditions and steepest decent.

### **Fundamental Rules:**

- (1) Make-up exams will only be given for extreme situations. If at all possible, students must contact me before the exam. Full adherence to this policy is the responsibility of the student.
- (2) The schedule and exam dates above are tentative, and it is the student's responsibility to keep abreast of changes.
- (3) Homework will be assigned each class and collected each week. All work must be clearly written. Illegible work will not be accepted.
- (4) There is a penalty of 10% of the total grade for each day that the homework is late.