

IME 6100
LINEAR PROGRAMMING FOR ENGINEERS
(46498)

Course Syllabus – Fall 2009

Room: CEAS D-208 *Time:* MW 5:30 – 6:45 PM

2009-2010 Catalog Description:

The study of linear programming models as applied to engineering problems. Topics include Revised Simplex Method, Duality Theory, Post-Optimality Analysis, Interior Point Algorithms, Column Generation and Decomposition Techniques, Transportation Problem, Assignment Problem, Multiple Objective Problems, Data Envelopment Analysis, and Integer Programming. Prerequisite: MATH 2300 or 3740.

Prerequisites:

- 1) Basic linear algebra (matrix algebra) skills.
- 2) The ability to use new software in problem solving given minimal instruction.

Instructor:

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Doctoral Associates:

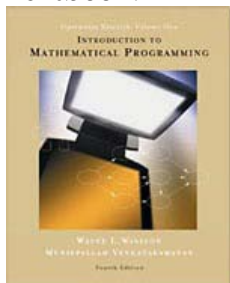
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Course Webpage:

<http://homepages.wmich.edu/~butt/ime610>

Textbook:



Introduction to Mathematical Programming (Operations Research: Volume 1)
4th edition (ISBN: 0-534-35964-7)
Wayne L. Winston and Munirpallam Venkataramanan
2003 Brooks/Cole (a division of Thompson Learning Inc.)

- Notes:* 1) Each student must have their own copy of this book.
2) Photocopies of this textbook (or any part) will not be allowed into lectures, tests, or the final exam!

References:

VBA for Modelers: Developing Decision Support Systems with Microsoft Excel
2nd edition
S. Christian Albright
South-West College Publishing, 2007 (ISBN-13: 978-0495106838)
(Third edition to be released in August 2009 by South-West College Publishing)

Introduction to Operations Research, 8th edition
Frederick S. Hillier and Gerald J. Lieberman
McGraw-Hill, 2005

Optimization in Operations Research, 1st edition
Ronald L. Rardin
Prentice Hall, 1998

Software:

GAMS 2.50 (GAMS/MINOS) (www.gams.com)
LINDO (LINGO) (packaged with text)
Microsoft EXCEL Solver & VBA (CAE)
WinQSB 2.0 © 2002, Yih-Long Chang (CAE)
(Wiley Publishing - ISBN: 978-0-471-40672-3 (ISBN: 0-471-40672-4))

Evaluation: Your final grade will be based on the following:

(1)	Assignments	15%
(2)	Project 1	5%
(3)	Project 2	15%
(4)	Test 1	20%
(5)	Test 2	20%
(6)	Final Exam	25%

Grading Scale:	93 - 100	A
	85 - 92	BA
	80 - 84	B
	75 - 79	CB
	70 - 74	C
	65 - 69	DC
	60 - 64	D
	Below 60	E

Attendance Policy: Attendance is mandatory. A student will receive a score of zero for any assessment/evaluation item not submitted because of absence. Extreme circumstances will be considered on an individual basis. Arrangements must be made prior to the due date (when reasonable), and supporting documentation is necessary (with exception of illness due to the H1N1 virus).

Academic Honesty Policy: You are responsible for making yourself aware of and understanding the policies and procedures in the Graduate Catalog that pertain to Academic Honesty. These policies include cheating, fabrication, falsification and forgery, multiple submission, plagiarism, complicity and computer misuse. [The policies can be found at www.wmich.edu/catalog under Academic Policies, Student Rights and Responsibilities.] If there is reason to believe you have been involved in academic dishonesty, you will be referred to the Office of Student Conduct. You will be given the opportunity to review the charge(s). If you believe you are not responsible, you will have the opportunity for a hearing. You should consult with me if you are uncertain about an issue of academic honesty prior to the submission of an assignment or test.

Assignments: Assignments are to be turned in at the beginning of lecture on the day the assignment is due. I will post assignments on the course webpage. You can work individually or in teams on the assignments (teams of no more than three). Only one copy of the assignment should be handed in from each team, with all names appearing on at least the first page. Late assignments will not be accepted. Many assignments will require the use of software. If you use software to solve a problem you must submit sufficient information to illustrate your approach to the problem, along with the appropriate output to justify your results. You will receive a score of zero for each assignment that you fail to turn in at the specified time.

Project 1: The purpose of this project is to give the student an opportunity to apply the formulation and duality concepts encountered in this course -- beyond basic homework exercises. The project will be conducted individually and a short directed write-up is required.

Project 2: The purpose of this project is to give the student an opportunity to apply the course concepts to a real world problem. The project will be conducted individually or in teams of no more than three (this number may vary depending on the number of students in the class). A final project report is required.

Tests: The two tests will be administered during the lecture period on the day indicated in the schedule. You are responsible for the material up to the day of each test. During each test you are allowed to use a calculator and one 8½" x 11" sheet of paper with anything you want written on the paper (you can use both sides of the sheet of paper). You will have 75 minutes to complete each test.

Final Exam: The day and time are listed in the schedule. The Project 2 presentations will take place during this time period and Project 2 reports are due on this day. During the final exam you are allowed to use a calculator and two 8½" x 11" sheets of paper with anything you want written on the paper (you can use both sides of each sheet of paper). You will have 120 minutes to complete the final.

Schedule: Please note that the topic schedule is a guide only, we may spend more or less time on a topic based on student backgrounds and class discussions. The test and final exam times will occur on the dates listed -- content of the tests may be altered based on the material covered prior to test date.

<u>Date</u>	<u>Topics</u>	<u>Chapter/Section</u>
September 9	Introduction to Linear Programming & Graphical Examples	1.1-1.2; 3.1-3.3
14	Problem Formulation	3.4-3.12
16	LP Software & Spreadsheet Software	4.9-4.10, 4.17
21	Review: Solving Systems of Linear Equations, Rank, Inverse	2.1-2.6
23	Converting to Standard Form & Basic Feasible Solutions	4.1-4.2, 4.4, 4.14
28	Algebra of the Simplex Method & Tableau Method	4.5-4.6
30	Revised Simplex Algorithm	10.1
October 5	Special Cases, Cycling & Degeneracy	4.3, 4.7-4.8, 4.11
7	Big M Method & Two-Phase Method	4.12-4.13
12	Test 1	
14	Interior Point Method (Karmarkar's Method)	4.15, 10.6
19	Multiattribute Decision Making – Goal Programming	4.16
21	Product Form of the Inverse	10.2
26	Sensitivity Analysis	(5.1-5.4); 6.1-6.4
28	Dual Simplex Method / Duality / Sensitivity Analysis	6.5, 6.11
November 2	Duality / Complementary Slackness	6.6-6.10
4	Duality / Data Envelopment Analysis	6.12
9	Bounded Variables Simplex Algorithm	(10.5)
11	Test 2	
16	Integer Programming Intro / Formulation & Models	9.1-9.2
18	Branch & Bound – Pure & Mixed Integer Programs <i>(Project Report 1 Due)</i>	9.3-9.4
23	Branch & Bound – Knapsack and Combinatorial Problems	9.5-9.6
Thanksgiving Recess – November 25 – 29		
30	Cutting Planes – Pure & Mixed Integer Programs	9.8
December 2	Column Generation / Dantzig-Wolfe Decomposition	10.3-10.4
7	Transportation Problem / Transshipment Problem	7.1-7.4, 7.6
9	Assignment Problem <i>(Project Report 2 Due)</i>	7.5
December 14	FINAL EXAM Period (Monday 7:15 - 9:15 PM)	