

OR 661

Linear and Integer Programming

Course Information

Staff Information



Professor Christopher M. Rump, Ph.D.

E-mail: cmrump@bgnet.bgsu.edu

Work phone: 419-372-8098

Work fax: 419-372-2875

Office Location: BA 363

Office hours: M, R 3:30-5 PM

Personal Link: cmrump.with.bgsu.edu



Course Textbook



[Ronald L. Rardin](#), *Optimization in Operations Research*, Prentice Hall, 1998.

Supplemental Textbooks



Chvatal, V., *Linear Programming*, Freeman, 1983.

Ignizio & Cavalier, *Linear Programming*, Prentice Hall, 1994.

Winston, W., *Introduction to Mathematical Programming*, 4th ed., Brooks/Cole, 2003.

Prerequisites



[MBA 601](#) *Quantitative Analysis for Managers*
(or equivalent or consent of instructor)

Catalog Description



Modeling decision problems via linear, goal, and integer programming; linear programming solution techniques, sensitivity analysis, dual, parametric programming, cutting plane and branch and bound method; current topics in integer programming.

Sketch of Syllabus



Topic	# Lectures
Introduction	1
Ch.2: Deterministic Optimization Models	3
Ch.4: Linear Programming (LP) Models	4
Ch.7: Sensitivity Analysis & Duality	3
Exam I: LP Models and Sensitivity Analysis	10
Ch.5: Simplex Solution Methods (& Column Generation)	9
Exam II: LP Solution Methods	9
Ch.8: Multi-Objective Goal Programming	2
Ch.11: Integer Programming Models	6
Exam III: Goal Programming and Integer Programming	8
Ch.6: Interior Point Solution Methods	4
Ch. 12: Discrete Optimization Solution Techniques	8
Final Exam: Interior & Discrete Solution Methods	12
Total	40

Course Objectives



- Give students an improved ability to
- Build & analyze quantitative models to support a decision-making process
- Read and perform applied research in the field of OR/MS

Student Learning Outcomes



- Upon successful completion of this course, students should be able to
- Demonstrate a basic knowledge of linear optimization models and methods
 - Recognize when and how these deterministic techniques are applicable
 - Identify data requirements for successful implementation of these methods
 - Create linear optimization models of OR/MS problems
 - Analyze the models to support the decision-making process

Student Assessment



Homework	75 points	18.75%
Mid-Term Exams (3) @ 75 points each	225 points	56.25%
<u>Final Exam</u>	<u>100 points</u>	<u>25%</u>
Total	400 points	100%

Grade Scale



85-100% A 65-85% B 45-65% C 30-45% D 0-30% F

Exam Policy



- Exams will not be cancelled or postponed by a posted note; only by a faculty member or secretary.
- No make-up quiz/exam will be given unless the instructor is notified in advance (except in emergency situations) and an official or acceptable written excuse is presented before rescheduling.

Homework Policy



- There will be several homework assignments.
- Homework assignments will be posted on Blackboard.
- The lowest score will be curved up & supplemented by bonus points for returning your student information index card with photo.
- Late homework will not receive credit.
- Most homework will provide good preparation for the exam. Although a team approach is encouraged, for your own benefit please attempt to start each problem on your own before sharing these strategies with members of a group.
- Homework doesn't necessarily prepare you only for exam problems, but may also provide some real-life problems requiring serious computational effort.

Software



- Optimization software will be vital for completing homework assignments.
- You may use GAMS (recommended by author), AMPL, LINDO, Excel Solver, etc.

Academic Honesty Policy



The instructor and students will adhere to the general [Code of Academic Conduct](#) defined in the BGSU Student Handbook. Specifically, students will not cheat, fabricate, plagiarize or facilitate academic dishonesty. Students who passively engage in cheating (i.e. allowing others to cheat off of them) may receive the same consequences as the person copying.

OR 661: Linear and Integer Programming Syllabus

Date	Text	Topics
Aug 25	1	Course Introduction & Motivation
Aug 27	2.1 - 2.2	Form of Optimization Models, Graphic Solution
Aug 29	2.4 - 2.7	Linear vs. Nonlinear, Discrete vs. Continuous, Multiple Goals
Sep 1	<i>Labor Day</i>	<i>No Class</i>
Sep 3 [♥]	2.3	Large-Scale Models & Optimization Software
Sep 5	4.1 - 4.2	Allocation & Blending Linear Programs (LPs)
Sep 8	4.3	Production Process Models
Sep 10	4.4	Shift Scheduling
Sep 12	4.5	Time-Phased Models
Sep 15	7.1 - 7.2, 7.6	What if? Sensitivity Analysis
Sep 17	7.3, 7.4	Primal & Dual Formulations
Sep 19	7.3, 7.5	Duality & Sensitivity Theory
Sep 22	5.1	LP Standard Form
Sep 24	5.2	Extreme-Points and Basic Solutions
Sep 26	2, 4, 7	<i>Exam I - Linear Optimization Modeling & Application</i>
Sep 29	5.3	Simplex Search Method
Oct 1	5.5	Two-Phase Simplex Search
Oct 3	5.6 - 5.7	Degeneracy, Cycling and Finiteness of Simplex Method
Oct 6	5.8	Revised Simplex Method
Oct 8	5.9	Lower & Upper-Bounded Simplex Method
Oct 8*	5.x	Dual Simplex Method
Oct 10	<i>Fall Break</i>	<i>No Class</i>
Oct 13	<i>INFORMS</i>	<i>No Class</i>
Oct 15	<i>INFORMS</i>	<i>No Class</i>
Oct 17	5.x, 11.3	Column Generation Method
Oct 20	5	<i>Exam II - Linear Programming Solution Methodology</i>
Oct 22	8.1 - 8.3	Goal Programming
Oct 24 [♦]	8.4	Multi-Objective Optimization Models
Oct 27	11.1	Lumpy LPs & Fixed Charge Integer LPs
Oct 29	11.2	Capital Budgeting Knapsack ILPs with Binary Logic
Oct 31	11.3	Set Packing, Covering & Partitioning Integer LPs
Nov 3	11.4	Assignment & Matching Models
Nov 5	11.6	Facility Location & Logistics
Nov 7	11.7	Processor Scheduling & Sequencing Models
Nov 10	12.1 - 12.2	Enumerating Solutions & Elementary Relaxations
Nov 12	12.3	Strengthening LP Relaxations
Nov 14	8, 11	<i>Exam III - Multi-Objective & Integer Modeling & Application</i>
Nov 17	12.4	Branch & Bound Search
Nov 19	12.4	Branch & Bound Search
Nov 21	12.5	Branch & Cut Search
Nov 24	~12.8	Implicit Enumeration
Nov 26	<i>Thanksgiving</i>	<i>No Class</i>
Nov 28	<i>Thanksgiving</i>	<i>No Class</i>
Dec 1	6.1	Interior Point Strategies for Solving LPs
Dec 3	6.2 - 6.3	Affine-Scaling Search Method
Dec 5	6.4	Log Barrier Interior Methods for Solving LPs
Dec 8	12.6	Improving Heuristics for Discrete Optimization
Dec 10	12.7	Tabu Search, Simulated Annealing, Genetic Algorithms
Dec 12	12.6 - 12.7	Search Heuristics
Dec 18	6, 12	<i>Final Exam (10:45-12:45) - Interior & Integer Solution Methodology</i>

♥ Meet in BAA 2004 computer lab

* Makeup lecture

♦ Last day to withdraw