SA305 – Linear Programming
Asst. Prof. Nelson Uhan

Spring 2014

Syllabus

Last updated: January 6, 2014

Course description Operations research (OR) is a broad field which, loosely speaking, investigates how mathematical techniques can be used to solve "real-life" decision-making problems. This course provides an introduction to linear programming, a fundamental technique used in OR. In particular, the course focuses on formulating mathematical optimization models (also called *mathematical programs*), and understanding the mathematical underpinnings of linear programming algorithms.

Textbook D. Rader, *Deterministic Operations Research: Models and Methods in Linear Optimization*, Wiley, 2010.

Schedule This schedule is subject to change.

Unit	Date	Topic	Reading
Overview	1/7	Introduction to operations research	1.1
	1/8	Introduction to optimization modeling, classification of optimization models	1.2, 1.3
	1/10	Graphical solution of optimization models, sensitivity analysis	1.2
Modeling	1/13	Resource allocation models, introduction to GMPL and GUSEK	2.1
	1/15	Work scheduling models	2.2
	1/17	Blending models	2.4
	1/20	Holiday – Martin Luther King Jr. Day	
	1/22	Production process models	2.5
	1/24	Production process models, cont.	2.5
	1/27	Multiperiod models	2.6
	1/29	Sets, summations, for statements	2.3
	1/31	Resource allocation models, revisited	2.1
	2/3	Work scheduling models, revisited	2.2
	2/5	Blending models, revisited	2.4
	2/7	Production process models, revisited	2.5
	2/10	Multiperiod models, revisited	2.6
	2/12	Review	
	2/14	**Exam 1**	

Unit	Date	Topic	Reading
Algorithms	2/17	Holiday – Washington's Birthday	
	2/19	Introduction to algorithm design	5.1–5.2
	2/21	Improving search: finding better solutions	6.1–6.2
	2/24	Improving search: convexity and optimality	6.3
	2/26	Improving search: review	6.1–6.3
	2/28	Geometry and algebra of corner points	7.1
	3/3	Geometry and algebra of corner points, cont., fundamental theorem of LP	7.1–7.2
	3/5	Linear programs in canonical form	2.8, 7.3
	3/7	Basic solutions in canonical form LPs	7.3
	3/10 – 3/14	Spring Break	
	3/17	The simplex method	8.1
	3/19	The simplex method, cont.	8.1
	3/21	The simplex method: review	8.1
	3/24	Degeneracy, convergence, multiple optimal solutions	8.3
	3/26	The two-phase simplex method	8.4
Duality	3/28	Bounds and the dual LP	9.1, 9.2
	3/31	Weak and strong duality, complementary slackness	9.3
	4/2	Review	
	4/4	**Exam 2**	
	4/7	Duality review, maximin objectives	9.1–9.3, 2.7
	4/9	Maximin and minimax objectives	2.7
	4/11	LP duality and game theory	handout
	4/14	An economic interpretation of LP duality	9.6
Modeling revisited	4/16	Introduction to networks and the shortest path problem	2.9
	4/18	Modeling with the shortest path problem	2.9
	4/21	Modeling with the shortest path problem, cont.	2.9
	4/23	Review	
	4/25	Review	
	4/28	Review	