

USC Viterbi School of Engineering

ISE 530 Optimization Methods for Analytics

Fall 2015, Tuesday, 6:30-9:10 pm

Location: KAP 148

Instructor: Dr. Sima Parisay

<http://ise.usc.edu/directory/sima-parisay.htm>

Office: ISE Department, GER 216C

Office Hours: Wed and Tues 4:30-6 pm

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Teaching Assistant: Alp Ozkan

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Office Hours: TBA

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IT Help:

Hours of Service:

Contact Info:

Course Description

This course is an introduction to deterministic linear modeling and their applications, as well as application for analytics. The emphasis will be on formulation skills, analysis skills, and communication skills. Analysis skills will lead to information mining that provides in-depth understanding of a system. The optimal solution of these models and the follow up analysis will assist in decision making regarding system design or its operation. Also application of some meta-heuristics for optimization will be discussed.

This course is designed for those with minimum background in this field and concentrates on application of these techniques.

Learning Objectives

- Formulation skills for problems as a linear mathematical model (linear programming, goal programming, integer programming, transportation, transshipment)
- Simplex method for solving linear programming (LP)
- Dual of an LP and its application
- Extensive sensitivity analysis to answer “what if” questions (for all models)
- Application of software to solve the problems
- Application of these model for analytics
- Application of heuristics and meta-heuristics for optimization

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Prerequisite(s): ISE 220 (Probability Concepts in Engineering), Math 225 (Linear Algebra and Linear Differential Equations)

Co-Requisite (s): None

Concurrent Enrollment: None

Recommended Preparation: None

Course Notes

The course materials are in the Course Reader and Blackboard.

Technological Proficiency and Hardware/Software Required

You will use a software of your choice for OR techniques

Required Readings and Supplementary Materials

Required: Course Handouts (Included in Course Reader, course Black Board, and in class) by Dr. Parisay. The Course Reader can be purchased from the USC Book store.

Required textbook: W. L. Winston, "Operations Research, Application and Algorithms", 4th Edition, Thomson Learning (Brooks/Cole Publishing Co), 2004, ISBN-10: 0534380581 | ISBN-13: 9780534380588. This book can be purchased from the USC Book store or any other sources.

Description and Assessment of Assignments

- **Midterm I** will be in-class based on the schedule, closed book, and 1.5 hours in length. Make up exam is only considered under documented emergencies, such as being hospitalized.
- **Midterm II** will be in-class based on the schedule, closed book, and 1.5 hours in length. Make up exam is only considered under documented emergencies, such as being hospitalized.
- **Final Examination** will be held at the completion of all classes based on the University schedule, closed book, and 2 hours in length. Make up exam is only considered under documented emergencies, such as being hospitalized.
- **Homework** are assigned each week, you will submit them to Blackboard before the next class (unless otherwise indicated). HW will be randomly selected for grading and returned the following week. No late homework will be accepted. No makeup homework will be considered. HW is expected to be typed, and professionally done.

- **Quiz/Participation** usually conducted at the beginning of each class and randomly collected for grading. Quizzes are based on only the previous class. No late quiz or makeup quiz will be considered.
- **Project/Term paper:** The project in this class is a team activity. Teams may select a topic according to the team members' interest. The project requires an initial report and a final report. Each one will be graded.

Grading Breakdown

Assignment	Points	% of Grade
Mid-Term I	20	20
Mid-Term II	20	20
Final Examination	20	20
Homework (3 best out of 5)	9	9
Quizzes (3 best out of 5)	12	12
Paper/Case study: initial report, final report	19	19
Total	100	100

Total points will be curved for the final letter grade. Letter grade with minus and plus are also considered. Please refer to another file called "Grading policy" on the Blackboard.

Assignment Submission Policy

Assignments should be submitted to the Blackboard before the class. It should be professionally done. I may require hard copy as well for some assignments. No late assignment is accepted. No makeup quiz is considered. Makeup exam is considered only under documented emergencies.

Additional Policies

**Cellular phones should be turned off in class. No texting in class.
Computers can only be used for class related material.**

Course Schedule: A Weekly Breakdown

Readings and Homework: They will be posted on Blackboard as lecture proceeds.

	ISE 530 Topics/Daily Activities Tentative (may change)	Readings and HW	Deliverable/ Due Dates
Week 1 Aug 25	Review of linear algebra and Gauss-Jordan method, LP problem formulation, Graphical solution of LP	Chapter 2 and 3	
Week 2 Sept 1	LP Problem formulation skills, Simplex method	Chapters 3, 4	Quiz, Homework
Week 3 Sept 8	LP Sensitivity Analysis	Chapter 5	Quiz, Homework
Week 4 Sept 15	Application of software, Report Writing, Blending Problem	Chapter 3	Quiz, Homework
Week 5 Sept 22	LP Problem Formulation Skills	Chapter 3	Quiz, Homework
Week 6 Sept 29	Midterm I (1.5 hour) Lecture: Dual Problem of LP	Chapter 6	
Week 7 Oct 6	Guest Speaker Economic Interpretation of Dual LP, Sensitivity Analysis	Chapter 6	Project teams
Week 8 Oct 13	Goal Programming (GP) Motivation and Formulation	Section 4.16	Quiz, Homework, Project proposal
Week 9 Oct 20	GP Sensitivity Analysis and Report Writing	Section 4.16	Quiz, Homework,
Week 10 Oct 27	Midterm II (1.5 hour) Lecture: Integer Programming		
Week 11 Nov 3	Branch-and-Bound Method	Section 9.3	Project initial report
Week 12 Nov 10	Transportation, Sensitivity Analysis, Transshipment, Report Writing	Chapter 7	Quiz, Homework
Week 13 Nov 17	Assignment, Travel Salesperson Problem	Chapter 7, Section 9.6	Quiz, Homework
Week 14 Nov 24	Discussion: 1) Application of ILP for Classification		Quiz, Homework

	and Regression 2) Heuristic and meta-heuristic for optimization of TSP		
Week 15 Dec 1	Project presentation		Final project, models, and PowerPoint file are due
FINAL Dec 15	Final Exam		

Statement for Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. Website and contact information for DSP:

http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html, (213) 740-0776 (Phone), (213) 740-6948 (TDD only), (213) 740-8216 (FAX) ability@usc.edu.

Statement on Academic Integrity

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. *SCampus*, the Student Guidebook, (www.usc.edu/scampus or <http://scampus.usc.edu>) contains the University Student Conduct Code (see University Governance, Section 11.00), while the recommended sanctions are located in Appendix A.

Emergency Preparedness/Course Continuity in a Crisis

In case of a declared emergency if travel to campus is not feasible, USC executive leadership will announce an electronic way for instructors to teach students in their residence halls or homes using a combination of Blackboard, teleconferencing, and other technologies.