

# USC Viterbi School of Engineering

**ISE 536 Linear Programming and Extensions**  
Spring 2018, Monday, 6:40-9:20 pm  
**Location:** OHE 100B

**Instructor: Dr. Sima Parisay**

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

**Office:** OHE 310U

**Office Hours:** Mon and Wed 4:30-6 pm

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**Teaching Assistant:** Siyuan Yao

**Office:** TBA

**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. 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.

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 (multi-objective) programming, integer programming, transportation, transshipment)
- Travel Sales Person (TSP) problems
- 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

**Prerequisite(s):** EE 441 (Applied Linear Algebra for 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 D2L.

### **Technological Proficiency and Hardware/Software Required**

You will use AMPL software for assignments and any software of your choice for project or case studies.

### **Required Readings and Supplementary Materials**

Required: Course Handouts (Included in Course Reader, course D2L, and in class) by Dr. Parisay. The Course Reader can be purchased from the USC Bookstore.

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** assignments are assigned each week, you will submit them to D2L before the next class (unless otherwise indicated). HW feedback and solution will be provided within a week from due date. HW will be randomly selected for grading. No late homework will be accepted. No makeup homework will be considered. HW is expected to be typed as much as possible, and professionally done. I may require hard copy as well for some assignments.
- **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.

- **Case study** in this class is a team activity. Each team will select a case study according to the team members' interest and in relation to the material covered in this class. The case study requires an initial report and a final report. Each one will be graded. The purpose of the case study is for you to utilize information you have learned during this class and to prepare a professional report. The case study is delivered as a hard copy report, as well as posting the Word file on D2L, on the last class session.

### 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)	9	9
Case study (initial and final report)	22	22
<b>Total</b>	<b>100</b>	<b>100</b>

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 D2L.

### 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 D2L as lecture proceeds.

Week	ISE 536 Topics/Daily Activities Tentative (may change)	Readings and HW	Deliverable/ Due Dates
1 Jan 8	Review of linear algebra and Gauss-Jordan method, LP problem formulation, Graphical solution of LP, Simplex method	Chapters 2, 3, and 4	
2 Jan 15	holiday		
3 Jan 22	LP Problem formulation skills, Application of software	Chapter 3	Quiz, Homework
4 Jan 29	LP Sensitivity Analysis, Report Writing	Chapter 5	Quiz, Homework
5 Feb 5	Dual Problem of LP Economic Interpretation of Dual LP	Chapter 3	Quiz, Homework
6 Feb 12	<b>Midterm I</b> (1.5 hour)  Lecture: Goal Programming (GP)		
7 Feb 19	Holiday		
8 Feb 26	Goal Programming (GP) Formulation, Sensitivity Analysis, and Report Writing	Section 4.16	Quiz, Homework
9 Mar 5	Integer Programming, Branch-and-Bound Method	Section 9.3	Quiz, Homework
10 Mar 12	Holiday		
11 Mar 19	Blending Problem, formulation skills		Initial report
12 Mar 26	<b>Midterm II</b> (1.5 hour) Lecture: Transportation Problem	Chapter 7	
13 Apr 2	Transportation Sensitivity Analysis, Assignment Problem	Chapter 7	
14 Apr 9	Transshipment Problem	Chapter 7	Quiz, Homework
15 Apr 16	Travel Sales Person problem		Quiz, Homework
15 Apr 23	Special cases in LP formulation		Final report
16	<b>Final Exam 7-9 pm</b>		

**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/academicssupport/centerprograms/dsp/home\\_index.html](http://sait.usc.edu/academicssupport/centerprograms/dsp/home_index.html), (213) 740-0776 (Phone), (213) 740-6948 (TDD only), (213) 740-8216 (FAX) [ability@usc.edu](mailto: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](http://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/D2L, teleconferencing, and other technologies.