

USC Viterbi School of Engineering

ISE 536 Linear Programming and Extensions

Fall 2019, Mon and Wed, 6:30-7:50 pm

Location: KAP 144

Instructor: Dr. Parisay

<https://ise.usc.edu/directory/faculty/profile/?lname=Parisay&fname=Sima>

Office: OHE 310U

Office Hours: Mon and Wed 2:30-3:15 and 5:15-6 pm

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Teaching Assistant: Ying Peng

Office and office Hours: TBA

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IT Help:

Hours of Service:

Contact Info:

Catalog Course Description

Linear programming models for resource allocation; simplex and revised simplex methods; duality; sensitivity; transportation problems; selected extensions to large scale, multi-objective, and special structured models.

Learning Objectives

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

- Formulation skills for problems as a deterministic 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)
- Transportation simplex method
- Dual of an LP and its application
- Extensive sensitivity analysis to answer “what if” questions (for all models) and report writing
- 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 the course Blackboard.

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 Blackboard, 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 exam** will be in-class based on the schedule, closed book, and 1:15 in length. Make up exam is only considered under documented emergencies, such as being hospitalized.
- **Final exam** 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 on Thursdays. You will submit your solution as a Word file on Blackboard before the next class on Wednesdays (unless otherwise indicated). No late homework will be accepted. No makeup homework will be considered. HW solution will be posted within few days after the due date. You need to refer to the posted solution as part of your next HW. HW is expected to be typed as much as possible and professionally done. A total of 9 HW will be assigned. 6 HW will be randomly selected for grading, each 3 points. Grading is based on your effort (not the exact solution). The sum of the best 4 grades of HW will be used as the total points for HW.
- **Quiz/Participation** may be conducted at the beginning of a class or any time during the lecture. Only 4 quizzes will be randomly conducted and collected for grading, each 4 points. Quizzes are based on what was covered during the previous two classes and the recent HW. No late quiz or makeup quiz will be considered. The sum of the best 2 grades of quizzes will be used as the total points for quiz.

- **Project/Case study:** The project in this class is a team activity. I will assign the teams after the Midterm. Some information in this respect is included in your Course Reader and more details will be posted on Blackboard as needed later on. The purpose of the project is for you to utilize information you have learned during this class and to prepare a professional report. The project is delivered as a hard copy report on the last class session, as well as posting the Word file of the report and model files on Blackboard.

Grading Breakdown

Assignment	Points	% of Grade
Midterm exam	20	20
Final Exam	30	30
Homework (4 best out of 6)	12	12
Quizzes (2 best out of 4)	8	8
Case study (initial and final report)	30	30
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 Blackboard for more details.

Assignment Submission Policy

Assignments should be submitted to the Blackboard based on the schedule of 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.**

Please bring your Course Reader to every class session.

Course Schedule: A Weekly Breakdown

Readings and Homework: They will be posted on Blackboard as lecture proceeds. Homework is due to be posted on Wednesdays before 5:30 pm.

Week	ISE 536 Topics/Daily Activities Tentative (updated and may change)	Readings and HW	Deliverable/ Due Dates
1 Aug 26, 28	Introduction to the course, Review of linear algebra and Gauss-Jordan method, LP problem formulation, Graphical solution of LP, Simplex method	Chapters 2, 3, and 4	
2 Sept 2 holiday, Sept 4	Application of software, LP Problem formulation skills	Chapter 3	Homework
3 Sept 9, 11	LP Sensitivity Analysis, Report Writing	Chapter 5	Homework
4 Sept 16, 18	LP Problem formulation skills, Report Writing		Homework
5 Sept 23, 25	Blending Problem, formulation skills Review for midterm		Homework
6 Sept 30, Oct 2	Review for midterm (Mon) Midterm (on Wed, 1:15 hour)		
7 Oct 7, 9	Dual Problem of LP	Chapter 6	
8 Oct 14, 16	Dual Problem of LP Economic Interpretation of Dual LP	Chapter 6	Homework
9 Oct 21, 23	Goal Programming (GP) Sensitivity Analysis and Report Writing	Section 4.16	Initial Project Report (Wed)
10 Oct 28, 30	Integer Programming, Branch-and-Bound Method	Section 9.3	Homework

Week	ISE 536 Topics/Daily Activities Tentative (may change), Cont.	Readings and HW	Deliverable/ Due Dates
11 Nov 4, 6	Transportation Problem and simplex transportation, Transportation Sensitivity Analysis	Chapter 7	Homework
12 Nov 11, 13	Assignment and Transshipment Problems	Chapter 7	Homework
13 Nov 18, 20	Travel Sales Person problem	Section 9.6	Homework
14 Nov 25, Nov 27 holiday	Special cases in LP formulation		Homework
15 Dec 2, 4	Special cases in LP formulation Review of final exam (Wed)		Final project report (Wed)
18 Dec 11	Final Exam 7-9 pm location will be announced		

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 D2L/Blackboard, teleconferencing, and other technologies.

Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, "Behavior Violating University Standards" policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

Support Systems:

Student Counseling Services (SCS) – (213) 740-7711 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. engemannshc.usc.edu/counseling

National Suicide Prevention Lifeline – 1 (800) 273-8255

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. www.suicidepreventionlifeline.org

Relationship and Sexual Violence Prevention Services (RSVP) – (213) 740-4900 – 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender-based harm. engemannshc.usc.edu/rsvp

Sexual Assault Resource Center

For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: sarc.usc.edu

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086

Works with faculty, staff, visitors, applicants, and students around issues of protected class. equity.usc.edu

Bias Assessment Response and Support

Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. studentaffairs.usc.edu/bias-assessment-response-support

The Office of Disability Services and Programs

Provides certification for students with disabilities and helps arrange relevant accommodations. dsp.usc.edu

Student Support and Advocacy – (213) 821-4710

Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. studentaffairs.usc.edu/ssa

Diversity at USC

Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. diversity.usc.edu

USC Emergency Information

Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible. emergency.usc.edu

USC Department of Public Safety – UPC: (213) 740-4321 – HSC: (323) 442-1000 – 24-hour emergency or to report a crime.

Provides overall safety to USC community. dps.usc.edu