



Viterbi School of Engineering

Will be updated

ISE 536 Linear Programming and Extensions

Units: 3

Fall 2020, Mon and Wed, 6:30-7:50 pm

Location: online, using Blackboard and Zoom

Instructor: Dr. Parisay

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

Office: Online

Office Hours: Wed, 11:30 am-12:30 pm

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Teaching Assistant: Ying Peng

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IT Help: ITS

Hours of Service:

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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.

Operations Research (OR) techniques to be covered are all deterministic linear mathematical models. Techniques to be covered: linear programming (LP) including simplex method, dual of LP, goal (multi-objective) programming (GP), integer programming (ILP), transportation, assignment, transshipment, and travel sales person (TSP)).

Learning Objective	Assignment/Assessment tools used
By the end of this course, students should be able to:	This learning objective and skill is measured by:
Reproduce knowledge of several OR techniques (OR knowledge)	Quizzes at the beginning of synchronized lectures based on pre-recorded video lectures and handouts. Quiz can be as multiple-choice or short written response
Employ OR software (Software skill)	Assigned homework
Formulate several styles of LP problems (Formulation skill)	Math formulation in exam and project
Analyze software output (Analysis skill)	Essay in exam and project, in-class work
Detect extra information (Critical thinking)	Presenting extra higher-level information in exam and project, optional and self-developed extra credit
Compile a well-structured final report (Communication skill)	Essay in exam and project, in-class work

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

This course will be conducted as a **Flipped Classroom**. There will be 1-2 pre-recorded video lectures each week that students have to watch and learn before the class. These videos will be accessible from the course Blackboard. Each video will be about half-an-hour and will cover the basic knowledge about each topic. There will be handouts on Blackboard to accompany these pre-recorded video lectures. The course materials (handouts and video lectures) are on the course Blackboard.

We will use synchronized (live) Zoom meetings (sessions) for lectures on Mondays and Wednesdays as well as office hours. The synchronized Zoom meetings will concentrate on more practice, answering common questions, and higher level of discussions. There will be in-class work during these meetings. Synchronized meetings will be recorded and posted for those who cannot attend these meetings.

Technological Proficiency and Hardware/Software Required

You will use a software of your choice to solve the problems. AMPL software will be covered for those interested.

Required Readings and Supplementary Materials

Required: Course Handouts and video lectures on Blackboard by Dr. Parisay.

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 exams** will be based on the schedule and will take 1:20 hours. Make up exam is only considered under documented emergencies, such as being hospitalized. There will be one midterm exam. A sample midterm exam will be added to the course Blackboard.
- **Final exam** will be held at the completion of all classes based on the University schedule and it takes 2 hours. Make up exam is only considered under documented emergencies, such as being hospitalized. A sample final exam will be added to the course Blackboard.
- **Homework** will be assigned each week on Thursdays. You will post your answer as a Word file on Blackboard before the next class on Mondays (unless otherwise indicated). No late homework will be accepted. No makeup homework will be considered. Homework is expected to be typed as much as possible and professionally done. Homework on average will take about 1 hour each week, depending on your background. A total of 10 HW will be assigned. All will be graded.
- **Project/Case study:** The project in this class is a team activity. I will assign the teams in week 3. Some information in respect to your project will be posted on Blackboard 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 one Word file per each team that is posted on Blackboard. There will be an initial report and a final report.
- **In-class work:** In-class work can happen any time during synchronized lecture. Types of in-class works are:
 - a) Breakout room in Zoom: Zoom will be used to randomly assign students to different virtual rooms. Students in one room will first introduce themselves, then select a reporter among themselves. They discuss the question and collectively decide about the answer. Breakout room may take 5 to 15 minutes and will be announce at the beginning of the breakout room. The reporter will present the collective answer when they leave the breakout room for in-class meeting. The assigned grade for this activity will be announced later on at the time we start a Breakout.

- b) Poll in Zoom: Using Zoom, I will take a poll on a topic while lecturing. It will take about 1 minute. This activity will have no grade and will be anonymous.
 - c) Short essay question: I will pose a question that its answer will be a short essay. I will announce if each student should provide his/her answer on Zoom's Chat feature or submit on BB at the time of question. A limited time (few minutes) will be allocated for your answer. The grade for this activity will be announced before we start it.
 - d) Multiple choice question: a multiple-choice question will be posted on screen and you write your selection on a private Chat to TA or instructor. The grade for this activity will be announced before we start it.
- **Quiz:** Quiz will be conducted at the beginning of scheduled synchronized classes (on Mon and Wed). Quiz will be based on the assigned pre-recorded video lecture and posted handouts on Blackboard. It will take about 10-15 min. It will require few short answers that you will type in a Word file. Then you will post your Word file on Blackboard.
 - **Students with asynchronized option:** Students who cannot attend the synchronized lectures will have a make up assignment for any quiz, multiple-choice test, essay, and Breakout room activity. These make up assignments will be announced later on.

Grading Breakdown

Assignment	Points	% of Grade
Midterm exam	15	15
Final Exam	25	25
Homework	10	10
Case study (initial and final report)	30	30
In-class work	10	10
Quiz	10	10
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 Scale and Policy" on Blackboard for more details.

Course Schedule: A Weekly Breakdown

Readings and Homework: They will be posted on Blackboard as lecture proceeds. Homework is due on Mon by 5:30 pm.

Week	ISE 536 Topics/weekly Activities Tentative Plan	Readings and pre- recorded videos	Due Dates
1 Aug 24 and 26	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 Aug 31 and Sept 2	Application of software, LP Problem formulation skills	Chapter 3	Homework quiz
3 Sept 7 holiday, Sept 9	LP Sensitivity Analysis	Chapter 5	Homework quiz
4 Sept 14 and 16	Dual Problem of LP	Chapter 6	Homework quiz
5 Sept 21 and 23	Goal Programming (GP)	Section 4.16	Homework quiz
6 Sept 28 and 30	Goal Programming (GP) Sensitivity Analysis and Report Writing	Section 4.16	Homework quiz
7 Oct 5 and 7	Review for midterm Midterm I (1.25 hour) on Oct 7		Homework Quiz (Oct 5)
8 Oct 12 and 14	Integer Programming, Branch-and-Bound Method Transportation Problem and simplex transportation	Section 9.3 Chapter 7	Initial Project Report (Oct 14)
9 Oct 19 and 21	Transportation Sensitivity Analysis Assignment Problems	Chapter 7	Homework quiz

Week	ISE 536 Topics/weekly Activities Tentative Plan, Continued	Readings and HW	Deliverable/ Due Dates
10 Oct 26 and 28	Transshipment Problems	Chapter 7	Homework quiz
11 Nov 2 and 4	Travel Sales Person problem	Section 9.6	Homework quiz
12 Nov 9 and 11	Discussion on LP analysis and report writing Blending problem		Homework quiz
13 Nov 16 and 18	Discussion on LP formulation and analysis Transshipment problem		quiz
14 Nov 23	Review of final exam		
18 Dec 2	Final Exam, 7-9 pm online		Final project report due at noon

ISE 536 COURSE SPECIFIC POLICIES

Dear students,

We all come from different backgrounds and hope for an excellent learning experience in a great learning environment. This handout is to clear MY EXPECTATIONS and POLICIES for this course.

Intellectual property policies:

This is a clarification that any misuse, inappropriate dissemination, or attempted sale of class recordings and handouts, as well the appropriation of intellectual property is not acceptable. It is student's responsibilities towards the appropriate use and handling of these recordings under existing SCampus policies regarding class notes (<https://policy.usc.edu/scampus-part-c/>). Students are not permitted to create their own class recordings without the instructor's permission. Violations of these policies will be met with the appropriate disciplinary sanction.

Netiquettes Policies

- Be respectful and considerate towards each other. Pay attention to the cultural and background differences.
- Live sessions (synchronized sessions) will be recorded and posted on Blackboard later on.
- It is preferred that students attend the synchronized sessions based on university schedule of the class. If a student cannot attend the synchronized session, he/she need to email Instructor at the beginning of the semester.
- While in live sessions (synchronized sessions) make sure to show your complete first name and last name, as in the roster. (I will guide you how to do so first day of class.)
- While in live sessions (synchronized sessions) try to have your VIDEO ON. It assists in building a sense of community. However, Internet signal issues can happen which may result in having have to turn off video in order to at least having a reasonable quality audio.
- While in live sessions (synchronized sessions) be respectful to the LEARNING ENVIRONMENT such as: be attentive, have proper background, follow attires' norms as in on-ground classrooms, and be in a stationary location (not driving). Notice all of these are helpful to reduce distraction for others who are present.
- While in live sessions, instructor will have everyone on MUTE to avoid unwanted background noises. You need to UNMUTE yourself when you need to talk and then MUTE yourself when done.
- While in live sessions, if you have question please use the Blue Hand feature of Zoom to raise your hand, or type your question in the Chat feature of Zoom. Instructor will stop at suitable points during live discussion and will answer the questions. TA may be present at Chat and answer the questions there. I may call on you to answer a question during the live session
- While in Zoom's Breakrooms, try to be active, but do not dominate conversations, and limit non-relevant conversations.
- While on Chat, Discussion Forum, and email, be respectful and sensitive to background differences. Do not criticize and offend another person in public.
- Discussion Forum (Board) feature of the course Blackboard can be used for questions that are not urgent. TA or instructor will check Discussion Forum once every few days to provide answers.
- If I notice violation of these expectations, I will require the student attend the asynchronous sessions instead of synchronized ones.

Communication Policies

- Students are required to use their USC email account for any contact with instructor through email. It is required to include the course number (ISE 536) in the subject of

the email. The instructor will reply to emails within 24 hours. It may take longer over weekends and holidays. The instructor does not respond to emails sent from non-USC accounts or email that does not have the course number on its subject.

- Instructor's office hours are open to all students and there is no need for prior appointment. However, if a student would like to have a private Zoom appointment, he/she can request it by sending an email. Provide several time windows that works for you so that I can select the one that works for me.
- Simple questions will be answered by email, but for more complex discussions students may need to make an appointment for Zoom meeting.
- To promote independence and critical thinking, students are encouraged to try to find their answers by checking the video lectures on Blackboard, posted handouts on Blackboard, and your textbook. You can also email your TA. If you do not find the answer you need, email the instructor.

In-Class Work Policies

There will be a variety of in-class work for students during synchronized sessions. There will be some other forms of work for students who cannot attend synchronized sessions (will be announced as lecture proceed.). In-class work is a replacement for both participation and attendance and it requires students to produce a small deliverable. All in-class works are open-note with a limited time. We will have some practices in class during the first week. Possible forms of in-class work are:

- Answering a question using Poll feature of Zoom. This is anonymous and not graded. No cooperation with other students is permitted.
- Answering a multi-choice question using related feature of Zoom. This will be graded. No cooperation with other students is permitted.
- Answering a question using Chat feature of Zoom. Answers should be send ONLY to TA or instructor. This will be graded. No cooperation with other students is permitted.
- Working in a small team on a question during Break-out room feature of Zoom. Then one of the students, as reporter, will post the answer on behalf of the team. No cooperation with other teams is permitted.
- Different forms of in-class work will have different point values. The point value will be announced at the time of the activity. The lowest three scores on in-class work will be dropped.
- For teamwork, all members will receive the same grade for the work submitted. Team members may change from one in-class work to the next. Members in teams will be assigned randomly and is not optional.
- In-class work may be assigned at any point during the class; students who miss the work for any reason such as arriving late or leaving early will not have an opportunity to make up the work.

Technology Policies

- You need to have access to a computer, the course Blackboard, and Zoom. It is preferred to have access to a camera for Zoom sessions.
- You need Word for your homework and exam.
- You need to use a software to solve the operations research problems. We will cover AMPL software. TA will provide you with related information. However, you can use any other related software. A software should be able to solve: linear programming, integer programming, goal programming, transportation, transshipment, and assignment problems.
- You may need to take a photo, with your cell-phone, from your hand-written answers and paste it in a Word file. Alternatively, you may want to scan your answers and then paste it in a Word file.

Exam and Homework Policies

- All exams and homework should be individual work, unless otherwise mentioned. They are open source, but copy/paste from the sources are not acceptable. The answers should be in your own words. Collaboration with other students, copying another student's work, is not permitted and it is VOILATION OF ACADEMIC INTEGRITY. Violation of this requirement will lead to missing the whole points related to that exam or homework. For example, if even a part of one question in exam is similar to the one for another student the whole grade of that exam will be zero for both students. Software such as TurnItIn will be used for checking similarities.
- Word files to be submitted for exam and homework should be saved as 'lastname-firstname-subject'. For example, if I am taking midterm exam, my related Word file for submission should be saved as 'Parisay-Sima-MidtermExam'. Another example, if I am submitting my homework for week 8, my related Word file for submission should be saved as 'Parisay-Sima-HW-week8'.
- There will be no make-up exam unless under emergency. Email the instructor as soon as possible to discuss alternate arrangements due to an emergency.
- It is expected to follow all deadlines, for homework and project. Late work will be penalized by a 50% deduction in the assignment grade every 24 hours late unless due to an emergency situation excused by the instructor. Email the instructor as soon as possible to discuss alternate arrangements due to an emergency.
- Policies in relation to the team projects will be announced with project requirements later on.

Quiz Policies

This course will be conducted as a **Flipped Classroom**. There will be a pre-recorded video lecture each week that students have to watch and learn before the class, usually on Mondays. These videos will be accessible from the course Blackboard. Each video will be about half-an-hour and will cover the basic knowledge about each topic. There will be handouts on Blackboard to accompany these video lectures. Students can email TA and instructor with their questions after watching these videos.

- The scheduled synchronized class will start with a quiz based on this pre-recorded video lecture. The quiz may take 10-15 minutes. Quizzes will have few questions that require short answers and/or multiple-choice questions. You need to have all your answers in a Word file and submit it on Blackboard.
- The Word file should be saved as 'lastname-firstname-quiz date'. For example, if I am taking this quiz on September 21, I will save my Word file as 'Parisay-Sima-Quiz-Sept21'.
- Quiz will be graded. The lowest two scores on quizzes will be dropped.
- There will be no makeup quiz unless under emergency. Students who cannot take synchronized classes will have a replacement for this quiz (will be announced later.).

The synchronized Zoom sessions will concentrate on more practice, answering common questions, and higher level of discussions.

USC'S STATEMENT ON ACADEMIC CONDUCT AND SUPPORT SYSTEM

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, policy.usc.edu/scientific-misconduct.

Support Systems:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call
studenthealth.usc.edu/counseling

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

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call
suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL), press "0" after hours – 24/7 on call
studenthealth.usc.edu/sexual-assault

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED) - (213) 740-5086 | Title IX – (213) 821-8298
equity.usc.edu, titleix.usc.edu

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298
usc-advocate.symphlicity.com/care_report

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity and Diversity | Title IX for appropriate investigation, supportive measures, and response.

The Office of Disability Services and Programs - (213) 740-0776
dsp.usc.edu

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Campus Support and Intervention - (213) 821-4710
campussupport.usc.edu

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101
diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call
dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call
dps.usc.edu

Non-emergency assistance or information.