Syllabus ISE-536

Linear Programming and Extensions

Fall 2025

Units: 4
Day: Tue/Thu 4:00 P.M.-5:50 P.M.
Location: DMC 157

Instructor:	Niloufar Izadinia
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Website:	https://viterbi.usc.edu/directory/faculty/Izadinia/Niloufar
Office Hours:	Wednesdays, 4:00 PM -4:45 PM, GER 202 Thursdays, 2:00 PM– 2:45 PM, GER 202
Teaching Assistant:	Mohammadsaeed Haghi
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Office Hours:	TBA by Brightspace announcement

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.

Prerequisites: None

Learning Objectives:
This course is designed for those with minimal background in this field and concentrates on the application of these techniques. After completing this course, students will be able to:

- Compare operations research (OR) techniques such as deterministic linear mathematical models, linear programming (LP) including simplex method
- Construct goal (multi-objective) programming (GP)
- Explain integer programming (ILP), transportation, assignment, transshipment, and traveling salesperson (TSP).

Technological Proficiency and Hardware/Software Required
Access to a computer is required. Prior knowledge of basic Python programming can be helpful.

Course Notes
Students will be responsible for downloading the lecture notes for each lecture from the course website. All handouts, including homework, homework solutions, exams, and exam solutions will be posted in the Brightspace course website. Additional readings and notes beyond the main texts used in the lectures will be provided by the instructor as needed.

Required Texts:

Optimization in Operations Research, first or second edition, Ronald L. Rardin [available online]

References:

Winston, Wayne. Operations Research: Applications and Algorithms, 4th ed. Thomsom Brooks/Cole, 2004. ISBN 978-0534380588. [out of print; available online]

Badiru, A. B., and O. Omitaomu. Handbook of Industrial Engineering Equations, Formulas, and Calculations. CRC Press, 2011. ISBN 978-1420076271. [available online at https://libraries.usc.edu/]

Eiselt, H. A., and Carl-Louis Sandblom. Operations Research: A Model-Based Approach. 2nd edition. Springer, 2012. ISBN 978-3642310539. [available online at https://libraries.usc.edu/] 3rd edition, 2022, ISBN 978-3030971618.

Ravindran, A. Ravi. Operations Research and Management Science Handbook. CRC Press, 2007. ISBN 978-0849397219. [available online at https://libraries.usc.edu/]

Grading Policy:

Homework	25%
Class Exercises and Participation	25%
Midterm	20%
Final exam	30%

Homework Assignments:

- Assignments are assigned on the second period of the week and **are due at midnight of Friday of the following week**, submitted through the assignment manager on Brightspace and will be returned electronically. Solutions will be posted after the assignment is due. It is imperative that you prepare for class. You will find it difficult to follow the discussion if you have not read the material.

- **Late homework submissions are not accepted under any circumstances**. However, **two lowest scores will be dropped (a missed homework is a zero).**

- It's OK to work on individual homework assignments together but finish it by yourself and indicate whom you worked with. Each student must turn in a separate homework. Do not give your files to others, and do not use others' files. Do not copy solutions from people you have worked with or from anyone else. Generated data and essay questions must be unique to each student. If you use solutions from prior semesters, or AI tools or any other resources indicate that. **If the answer is given in a book or any sources, don't just copy it, explain how you got it and refer to it.**

- The assignments should be as professional in appearance as if you were preparing reports at work or for publication.

Participation and Class Exercises:

General:
This is intended to be an interactive class and your participation should increase as the semester progresses. Students are expected to have read the preparation material and participate actively in the discussions and exercises in the class. You should be prepared to devote the time necessary to take the course. The course material is cumulative, and you need to keep up as we go along.

Attending **all** classes for the **whole** duration of class is expected of everyone. Frequent absences will result in a reduction in grade. Punctuality is expected.

In-class exercises and mini-projects:
There will be several in-class exercises and challenges that you should do during the class time.
Laptops, desktops, or iPads are required to do and submit these exercises. **The students do them in pre-assigned teams**.

Examinations:

- The midterm and final will be based on homework assignments, the discussions, notes and in-class exercises. Students are expected to apply what they should have learned up to that point to analyzing situations, identifying the problems, and applying the appropriate techniques to solve them or interpreting computer solutions.
- The midterm and final exams are **open book and open notes** and **take home**.
- Calculators are OK but **laptops or desktops are required**[1].
- Exams are to be uploaded on **Brightspace**.
- The students will have **until the midnight of the next day of the exam** to take the exam on Brightspace (i.e. more than 24 hours).
- Note that the exams **are not timed** but the students have only **one attempt** to complete the exam.
- **There will be no class on the exam days.**

Test Schedule:

	Start	**Due**
Midterm	Thursday, October 16, 2025, 4 pm	Friday, October 17 at midnight
Final	Wednesday, December 10, 2025, 4:30 pm	Thursday, December 11 at midnight

Tentative Course Outline:

The approximate breakdown for course material follows below:

- Introduction to optimization
- Modelling optimization problems
- Linear programming and solution algorithms (Simplex, …)
- Duality theory and Sensitivity analysis
- Discrete (Integer) optimization modelling
- Basic Integer programming algorithms (Branch and Bound, …)
- Network Optimization
- Goal Programming (multi-objective optimization)
- Large-scale optimization

[1] https://itservices.usc.edu/spaces/laptoploaner/

Important Notes:

- The syllabus may get updated during the semester.
- In all your emails to the instructor, **copy the TA** as well to make sure you get the response as soon as possible.
- **Include "ISE 536"** at the beginning of all your email titles to get the response as soon as possible.
- **ALWAYS BE SURE TO GIVE THE SOURCE OF ALL YOUR INFORMATION. ANYTHING TAKEN VERBATIM FROM SOMEONE ELSE MUST BE IN QUOTATION MARKS AND REFERENCED. THIS INCLUDES PARTIAL SENTENCES.**
- Grading Scale Course final grades will be determined using the following scale

A	[95, 100]	C	[74, 77)
A-	[90, 95)	C-	[70, 74)
B+	[87, 90)	D+	[67, 70)
B	[84, 87)	D	[64, 67)
B-	[80, 84)	D-	[60, 64)
C+	[77, 80)	F	< 60

Statement on Academic Conduct and Support Systems

Academic Integrity:
The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, comprises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university's mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see the student handbook or the Office of Academic Integrity's website, and university policies on Research and Scholarship Misconduct.

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University's educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

988 Suicide and Crisis Lifeline - 988 for both calls and text messages – 24/7 on call
The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1

(800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL) – 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

Office for Equity, Equal Opportunity, and Title IX (EEO-TIX) - (213) 740-5086
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
Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

The Office of Student Accessibility Services (OSAS) - (213) 740-0776
OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

USC Campus Support and Intervention - (213) 740-0411
Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity, Equity and Inclusion - (213) 740-2101
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
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) 442-1200 – 24/7 on call
Non-emergency assistance or information.

Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)
A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

Occupational Therapy Faculty Practice - (323) 442-2850 or otfp@med.usc.edu
Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.