



**Daniel J. Epstein Department of Industrial and Systems Engineering  
University of Southern California**

Course Syllabus  
ISE 330 – Introduction to Optimization

## **INSTRUCTOR**

Amir Gharehgozli, Ph.D.

## **TEACHER ASSISTANT**

Negin Ashrafi [ashrafin@usc.edu](mailto:ashrafin@usc.edu)

## **MEETING TIME AND PLACE**

TuTh 8:00AM - 9:50AM

[THH](#)116

## **INSTRUCTOR INFORMATION**

Office Location	GER 242A
Office Hours and location	Wednesdays 4:00PM - 5:00PM (or by appointment) Via Zoom or in person by appointment
Web information	Course materials and supplementary handouts are available on Blackboard.
Contact students	The instructor will use Blackboard as the primary means of contacting you. Please check the announcements frequently.
Email	Please use Blackboard to send me an email (during the first session, we will discuss where we can find it on Blackboard and how we can work with it.)

## **DISCLAIMER**

This syllabus, course schedule, and the contents of course web site are subject to change in the event of extenuating circumstances. If you are absent from class, it is your responsibility to check on announcements made while you were absent. If you have any questions about the material contained in this syllabus, please contact me. Your continued enrollment in the course evidences your agreement to the policies contained herein.

## TEXTBOOK

The following textbook is the main textbook for this course. Extra materials may be provided for every session.

Course Text (required)	<b>Introduction to Operations Research</b> , 11th Edition <b>ISBN10: 1259872998   ISBN13: 9781259872990</b> By Frederick Hillier and Gerald Lieberman © 2021 <a href="https://www.mheducation.com/highered/product/introduction-operations-research-hillier-lieberman/M9781259872990.html">https://www.mheducation.com/highered/product/introduction-operations-research-hillier-lieberman/M9781259872990.html</a> Only the textbook; no access code, online tool, etc. is required.
Course Text (suggested)	<b>Business Analytics   5th Edition</b> <b>Jeffrey D. Camm/James J. Cochran/Michael J. Fry/Jeffrey W. Ohlmann</b> © 2024 <a href="https://www.cengage.com/c/business-analytics-5e-camm-cochran-fry-ohlmann/9780357902202/">https://www.cengage.com/c/business-analytics-5e-camm-cochran-fry-ohlmann/9780357902202/</a>
Other Materials	Required readings for each session will be provided online.

## USC CATALOGUE DESCRIPTION

Modeling, analysis solution, and applications of complex decision problems using linear, dynamic, and integer optimization.

## COURSE DESCRIPTION

This course is a basic introduction to important models and solution methods in Industrial and Systems Engineering (ISE). ISE is concerned with the modeling, analysis, and solution of complex decision problems that arise in the management or design of a large-scale industrial system such as a supply chain, transportation network, or manufacturing assembly line. This course will focus specifically on the modeling and solution of linear programs, dynamic programs, and integer programs, as well as additional applications thereof in transportation, logistics, supply chain management, among others.

## LEARNING OBJECTIVES

At the conclusion of this course, students will be able to...

1. Describe examples of the kinds of problems linear, integer, and dynamic optimization have been used to solve.
2. Construct mathematical models for optimization problems that arise in many different industries and application areas.
3. Identify the special features of a model that make it a linear, integer, or dynamic programming model.
4. Solve two-variable linear programming models by the graphical solution procedure.
5. Explain the importance of extreme points in obtaining and characterizing the optimal solution to a linear optimization problem.
6. Explain how alternative optimal solutions, infeasibility and unboundedness can occur in linear programming problems.

7. Apply the duality theory to analyze a linear programming problem, such as in sensitivity analysis.
8. Demonstrate how to solve mathematical optimization problems by hand or with computer software.

**PREREQUISITE(S):** MATH 225 – Linear algebra and linear differential equations

**CO-REQUISITE(S):** None

**CONCURRENT ENROLLMENT:** None

### **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 Blackboard course website:

<https://blackboard.usc.edu/>

Additional readings and notes beyond the main texts used in the lectures will be provided by the instructor as needed.

### **TECHNOLOGICAL PROFICIENCY AND HARDWARE/SOFTWARE REQUIRED**

Nothing of note; access to a computer is required.

### **TEACHING STRATEGIES**

My philosophy for the learning environment is the role of the professor as director of learning among equals. I try to instill in students that they must be their own teachers gathering and discarding the appropriate skill sets for lifelong learning, success, and service to society. Therefore, Teaching/Learning Activities can be summarized as follows:

- Instructor
  - Instruct students on which resources to use in order to learn a topic.
  - Provide insights through PowerPoints/discussion board explanations/videos for specific and difficult to grasp topics.
  - Meet with students with appointments to review questions.
  - Review and grade and projects returning detailed comments.
- Students
  - Read books and papers assigned in a timely fashion.
  - Do the assignments in a timely fashion.
  - Write critically analyzed paper using concepts and terms learned

### **Blackboard**

Blackboard is USC's primary Learning Management Software and used for communications, course material and lessons. Check the site daily. Make use of the online environment and its collaborative

features (discussion/bulletin board, course email, etc.) to work with your classmates virtually. Check the course website and your campus email address daily.

Make sure you are able to navigate Blackboard. A brief introduction to Blackboard will be given during the first session. More info can be found at <https://blackboard.usc.edu/>. Should you experience a technical computer problem, contact the IT Help Center.

...Keep in mind that we will be relying heavily on technology for many of the assignments and exams. There is always the chance that your internet will be momentarily down when accessing course materials, assignments or exams. Please make sure you are giving yourself enough time to review the course materials and complete the assignments for the course to minimize any unforeseen challenges. I strongly encourage you to not wait until the last minute before the deadlines to complete the assignments. I have tried to give you a flexible window to complete the assignments from when they post to when they are due (which will be listed online). For the exams, I am always available to address any technical issues immediately.

## COURSE ASSESSMENTS

Students will be evaluated in the following manner. The instructor reserves the right to change course requirements and grading to optimize the student learning experience. Students will be notified in advance of any such changes. Final grade will not be curved.

## GRADING

Method of evaluation	Weight	Points (max)
Midterm 1	25%	$100 \times 25\% = 25$
Midterm 2	25%	$100 \times 25\% = 25$
Final	25%	$100 \times 25\% = 25$
Quizzes and Homework Assignments (each 100 points. The average is used in the third column.)	15%	$100 \times 15\% = 15$
TA sessions – quizzes and participation	10%	$100 \times 10\% = 10$
Total	100%	100
Instructor discretion		+ / -

Letter grade	Range of total points
A	$93 \leq \text{Grade} \leq 100$
A-	$90 \leq \text{Grade} < 93$
B+	$87 \leq \text{Grade} < 90$
B	$83 \leq \text{Grade} < 87$
B-	$80 \leq \text{Grade} < 83$
C+	$77 \leq \text{Grade} < 80$
C	$73 \leq \text{Grade} < 77$
C-	$70 \leq \text{Grade} < 73$
D+	$67 \leq \text{Grade} < 70$
D	$63 \leq \text{Grade} < 67$
D-	$60 \leq \text{Grade} < 63$
F	$0 \leq \text{Grade} < 60$

\* The instructor reserves the right to not curve or round up grades even for 0.01 points.  
\*\* The instructor reserves the right to not curve or round up grades on an individual basis.  
\*\*\* The instructor reserves the right to change course requirements and grading to optimize the student learning experience. Students will be notified in advance of any such changes.

## EXAMS

The exams will be closed-book and closed-notes exams. A formula sheet is allowed on the exam days. **No make-up exam will be given except for unusual circumstances such as severe illness, extremely important meeting and so forth.** Such cases should be supported by written evidence. If you have such an incident, please inform me of your situation by the exam date/time, otherwise you will receive a “zero” for the missed exam.

In case of emergencies or other unexpected circumstances on campus beyond my control, the date, location, and format of the final exam may be changed. I will notify as soon as possible of any such changes.

## Homework Assignments

Three homework assignments will be given during the semester. The deadlines will be before the midterm and final exams. Homework assignments will be multiple choice questions (around 25 questions). Homework assignments will be available to you on Blackboard a few days before the deadlines. You can login and input your answers only once. There is no time limit for this assignment. You can exit and return multiple times. Your progress will be saved.

Working hard on these homework assignments not only helps you to get a better grade for your homework assignments, but also helps you to get a better grade in your exams.

**No make-up homework assignment will be given except for unusual circumstances such as severe illness, extremely important meeting and so forth.**

## POP QUIZZES

Pop quizzes will be used to evaluate your attendance and participation.

Pop quizzes will be given anytime regularly throughout the semester. No makeup quiz will be given (No Exception). Thus, it is very important to arrive for class on time and stay in the classroom until the class is over.

## ATTENDANCE AND PUNCTUALITY

Class attendance is mandatory. Almost every session, there will be one quiz (or multiple quizzes) to check your attendance and participation. Each quiz has 100 points. Quizzes may be at the first moment of the class, in the middle of the class, AND/OR at the last moment of the class. You cannot take the quiz even if you are 1 second late or have already left.

Attendance quizzes have easy questions. For example: Today is ----? (a) Monday (b) Tuesday (c) Wednesday (d) None of the above.

Participation quizzes will be from course materials.

If you need to miss a class, please notify the instructor in advance, with the reason for your absence.

As a courtesy to other students and the instructor and as a demonstration of responsibility, students are expected to be in the class on time. Repeated failure to arrive to class on time will result in a substantial grade adjustment at the end of the semester.

Students are also expected to stay in the classroom until the class is over. Please do not leave in the middle of a lecture as it causes disruption.

No personal conversation is permitted during the class.

Please turn off or keep pagers, phones, watch alarms, etc. in the silent mode during class.

### **CLASS PARTICPATION**

The classroom is a laboratory in which you can test your ability to present your analysis, recommendations, and implementation plans. Active participation in all class discussions is essential to derive the full benefit of this course.

This class is heavily quantitative and often requires the use of the textbook, a calculator. Students are expected to come to class with these items so they can actively participate in classroom activities.

Please note that a perfect attendance does not guarantee a full credit (100 points) for this grading item. Your active participation does. Students are expected to attend all classes and to be on time for class. If you happen to miss a class, you are responsible for all the missed materials due to your absence. Office hours will NOT be used to go over the materials for missed classes.

**Course outline:** The following course outline specifies the topic that will be discussed each week. The required preparation for each class, including readings, cases and other assignments will be posted later. Please consult the outline carefully. The outline is due to changes.

Session	Date	Content	Chapter
1	01/09/2024	Lecture	Chapter 1. Introduction
2	01/11/2024	Lecture	Chapter 2. Overview of How Operations Research and Analytics Professionals Analyze Problems
3	01/16/2024	Lecture	
4	01/18/2024	Lecture	
5	01/23/2024	Lecture	Chapter 3. Introduction to Linear Programming
6	01/25/2024	Lecture	
7	01/30/2024	Lecture	Chapter 4. Solving Linear Programming Problems: The Simplex Method
8	02/01/2024	Lecture – Computer Implementation by the TA	
9	02/06/2024	Lecture <i>Homework Assignments Review 1</i>	
10	02/08/2024	Midterm exam 1	
11	02/13/2024	Lecture	Chapter 5. The Theory of the Simplex Method
12	02/15/2024	Lecture	
13	02/20/2024	Lecture	Chapter 6. Duality Theory
14	02/22/2024	Lecture	Chapter 9. The Transportation and Assignment Problems
15	02/27/2024	Lecture	
16	02/29/2024	Lecture	
17	03/05/2024	Lecture – Computer Implementation by the TA	
18	03/07/2024	Lecture <i>Homework Assignments Review</i>	
19	03/12/2024	Spring Recess	
20	03/14/2024	Spring Recess	
21	03/19/2024	Midterm exam 2	
22	03/21/2024	Lecture	Chapter 10. Network Optimization Models
23	03/26/2024	Lecture	Chapter 11. Dynamic Programming
24	03/28/2024	Lecture	Chapter 12. Integer Programming
25	04/02/2024	Lecture	
26	04/04/2024	Lecture	Chapter 6. Data Mining (time permitting)*
27	04/09/2024	Lecture	*From the Business Analytics by Camm et al.
28	04/11/2024	Lecture	
29	04/16/2024	Lecture	
30	04/18/2024	Lecture	
31	04/23/2024	Lecture – Computer Implementation by the TA	
32	04/25/2024	Lecture <i>Homework Assignments Review</i>	
33	TBD	Final exam	

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## 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](http://policy.usc.edu/scampus-part-b). Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on [Research and Scholarship Misconduct](#).

### 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](http://osas.usc.edu). You may contact OSAS at (213) 740-0776 or via email at [osasfrontdesk@usc.edu](mailto:osasfrontdesk@usc.edu).

### SUPPORT SYSTEMS:

*Counseling and Mental Health - (213) 740-9355 – 24/7 on call*

[studenthealth.usc.edu/counseling](http://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](http://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](http://studenthealth.usc.edu/sexual-assault)

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

*Office for Equity, Equal Opportunity, and Title IX (EEO-TIX) - (213) 740-5086*

[eeotix.usc.edu](http://eeotix.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.symplicity.com/care\\_report](http://usc-advocate.symplicity.com/care_report)

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.usc.edu](http://osas.usc.edu)

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) 821-4710*

[campussupport.usc.edu](http://campussupport.usc.edu)

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*

[diversity.usc.edu](http://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](http://dps.usc.edu), [emergency.usc.edu](http://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](http://dps.usc.edu)

Non-emergency assistance or information.

*Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)*

[ombuds.usc.edu](http://ombuds.usc.edu)

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) 442-3340 or [otfp@med.usc.edu](mailto:otfp@med.usc.edu)

[chan.usc.edu/otfp](http://chan.usc.edu/otfp)

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.