

DSO 570 – The Analytics Edge: Data, Models, and Effective Decisions (for MSBA Students)



Syllabus – Fall 2024 – 3.0 Units

Professor: Peng Shi

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Office: Bridge Hall 303D

Course Times: Section 16293: Tuesday/Thursday 12:30-1:50pm JKP-212
Section 16291: Tuesday/Thursday 2:00- 3:20pm JKP-212

Office Hours: Tuesdays 9-11am (via Zoom) or by appointment. You can reserve a 15-minute slot for the upcoming week using this link: <https://calendly.com/pengshi/dso570>

Course Description

This course equips students to be practitioners of *prescriptive analytics*, which is the science of decision making using rigorous mathematical tools of simulation and optimization. Students will create simulation models using Python, as well as formulate linear optimization models that can be scaled up to solve real-world problems. Application areas include business strategy, inventory management, revenue management, resource allocation, matching, scheduling, and personal optimization.

Learning Objectives

Upon successful completion of this course, students will be able to:

1. **Create** Python code to automate a given task.
2. **Formulate** linear optimization models to inform a business decision.

Prerequisites:

All of the required course material will be posted on Brightspace and available online. The majority of content are found on a handout that is associated with each class session. The handout is available on Brightspace and the professor will provide a hard copy at the beginning of each class session. If you have any questions or need assistance with the Brightspace Course Pages, please contact the Marshall HelpDesk at 213-740-3000 or HelpDesk@marshall.usc.edu.

Students must have access to a laptop that they can bring to class. Moreover, it is recommended that students install the latest Miniconda distribution for Python 3.X, available at <https://docs.conda.io/en/latest/miniconda.html>. Miniconda is a lite version of Anaconda that requires less hard-drive space and is easier to customize. Students are discouraged from using a Python installation based on pip or a distribution system other than conda, as this would create technical difficulties later on. **See the “Installation Instructions” module in Brightspace for detailed instructions. Python installation must be completed before the first class.**

Communication Policy:

Throughout the semester, I am committed to respond to student email as soon as I can. The maximum response time would be by the next business day that the email is received. (For example, for an email received on Monday, I will respond by Tuesday at the latest. For an email received on Friday, Saturday, or Sunday, I will respond by Monday at the latest.) Note that these are maximum response times, and most of the times I will respond much sooner.

Classroom Policy:

To succeed in this course, it is very important that students attend every class (except when they are sick) and complete the associated exercises in a timely manner. At the beginning of each class, the instructor will distribute a paper handout containing all the material required for the session, and students should

write notes on the handout and keep all the handouts from every class. Students should bring a computer to each class, but should only use it during the time allotted for the hands-on coding activity. During all other times, students should close all laptops and refrain from using cell phones. Throughout the duration of the class, students should not access Facebook, YouTube, Twitter, Instagram, TikTok, or any other website that is not related to the course, as this may be a distraction for the students themselves and their peers. Every class session will be recorded using Panopto and the videos will be accessible from Brightspace shortly after each class. Students who are sick should use these recordings to catch up and complete the exercises as soon as they are able. Please do not hesitate to reach out to me by email or book an office hour slot for extra help.

Pursuant to the USC Student Handbook (<https://policy.usc.edu/studenthandbook/>, page 57), students may not record a university class without the express permission of the instructor and announcement to the class. In addition, students may not distribute or use notes or recordings based on USC classes or lectures without the express permission of the instructor for purposes other than personal or class-related group study by students registered for the class. This restriction on unauthorized use applies to all information that is distributed or displayed for use in relationship to the class. Violation of this policy may subject an individual or entity to university discipline and/or legal proceedings.

Grading:

Grading will be based on adding up the number of points obtained in each of the following assessments, weighted according to the proportion given in the third column below.

Assessment	Description	Weight
Participation	It is important that you attend every class (unless you are sick), and participate actively by contributing to discussions, focusing on the in-class exercises during the allotted times, and respect others’ learning. At any time during class, students should not be completing work for another class, or accessing apps or websites unrelated to course content, including Facebook, YouTube, Instagram, TikTok, Wechat, etc. When the professor requests, students should put away all cell phones and laptops and participate actively in the lecture or discussion. Unexcused absences or violations of classroom policy would result in a zero participation grade for that class session.	9%
Exercises	For optimal learning, it is essential that students practice what they learn as soon as they learn it. Therefore, every class session will devote time to solving in-class exercises. There are also homework exercises should be completed shortly after each class. All of the exercises given during a week are to be submitted via Brightspace by the following Monday at 9am, unless Monday is a university holiday in which case the due date is Tuesday. Exercises should be completed individually. Although you can discuss ideas with peers, you must write your own submission and you can never copy-paste from another source. GenAI assistance should not be used in this class.	25%
Quizzes	About every two weeks, there is a quiz conducted at the beginning of class, to assess your mastery of course material in the previous two weeks. The quizzes are handwritten, open-notes and closed-computer, meaning that you can bring any books or paper notes, but cannot use a computer, a cell phone, a tablet, or any other electronic device with possible internet access. There are four quizzes, each worth 3%. If you miss a quiz, the weight will be transferred to the next exam.	12%

Midterm Exam	This exam is handwritten, open-notes, closed-computer, and takes place in class. (As with the quizzes, you can bring any books or paper notes, but no electronic devices are allowed.) The exam is 80 minutes.	24%
Final Exam	As with the midterm, the final exam is handwritten, open-notes and closed-computer. It is 100 minutes and takes place during the finals week, at a time determined by the MSBA program.	30%
Total		100%

The final letter grade will be assigned based on your total points above. The conversion from total numerical points to a letter grade is based on the following table.

Letter Grade	Corresponding numerical point range
A	≥ 92
A-	≥ 84 and < 92
B+	≥ 72 and < 84
B	≥ 60 and < 72
B-	≥ 48 and < 60
C+	≥ 34 and < 48
F	< 34

Exam Rescheduling:

If you have a medical or family emergency, I can work with you to create a makeup exam to be completed at another date. **For all other reasons of missing the exam, including travels for non-emergencies, interviews, or forgetfulness about exam date, the student will not be allowed to reschedule and will receive a zero for the exam.**

Assignment Submission Policy:

All exercises must be submitted via Brightspace before the time it is due (which is usually 9am on Mondays). If your Internet or Brightspace breaks down, then you should email the submission to the instructor as soon as you regain web access, along with a screenshot verifying the latest date of modification of the attached file. **Unless you can document that you completed the assignment before the deadline or have a documented medical or family emergency, no late submissions will be considered for grading.** This policy is strict and the Brightspace system will not accept submissions after the given timestamp. The purpose of this policy is so that the instructor can release the solutions to exercises immediately after they are due while the problems are still fresh in students' minds, and to train students to be assiduous in completing tasks on-time, which is an important part of professionalism.

AI Policy:

In recent years, generative AI technologies such as GPT and Github Copilot have become proficient in writing certain types of code and can help programmers increase productivity. However, the developers of these tools have cautioned that for novice programmers, adopting these tools may result in over-reliance and a worse learning outcome. Therefore, the use of these tools is strongly discouraged in this class. **You should complete the weekly exercises yourself, without using AI tools, as this would help you to master the syntax yourself and help the instructor give you more appropriate feedback.** Moreover, all of the quizzes and exams are handwritten and closed-computer. Therefore, you would be better prepared for these assessments if you are used to coding without any AI-assistance.

Requests for Re-Grading:

If you feel that an error has occurred in the grading of any assignment, you may, within one week of the date the assignment is returned to you, write me an email in which you request that I re-grade the assignment. Attach the original assignment to the email and explain fully and carefully why you think the assignment should be re-graded. Be aware that the re-evaluation process can result in three types of grade adjustments: positive, none, or negative.

The Importance of Course Evaluations:

This course is continuously improved, based on feedback from students and instructor observations. Please participate in the mid-term and end-of-term course evaluations online. Your feedback would be much appreciated and I will read each evaluation carefully and use it to improve the course for the future.

ADDITIONAL INFORMATION

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, compromises 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](#).

Open Expression and Respect for All:

An important goal of the educational experience at USC Marshall is to be exposed to and discuss diverse, thought-provoking, and sometimes controversial ideas that challenge one's beliefs. In this course we will support the values articulated in the USC Marshall "Open Expression Statement" (<https://www.marshall.usc.edu/open-expression-statement>)

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.

Grade Disputes

All grades assigned by faculty members are final. Students have the right to seek explanation, guidance, counsel and reasons for the assignment of a grade. Faculty may initiate a change in grade if there is an error in the calculation of a grade. Students may appeal a grade according to university policy as set forth in *SCampus*. A faculty member may not change a disputed grade outside the formal appeals process. In response to a disputed academic evaluation by an instructor, a student is entitled to two levels of appeal after review by the instructor: first to the chairperson of the department and then to the appropriate dean of the school. The full university policy can be found in *SCampus* under University Governance / Academic Policies at <https://policy.usc.edu/scampus-part-c/>.

COURSE CALENDAR

Week	Session	Date	Topic	Due date of the week's exercises (Due by 9am)
1	1	8/27	Review of Python syntax	Tuesday 9/3
	2	8/29		
2	3	9/3	Mastering loops	Monday 9/9
	4	9/5		
3	5	9/10	Algorithmic thinking	Monday 9/16
	6	9/12 (Quiz)		
4	7	9/17	Coding and debugging more quickly	Monday 9/23
	8	9/19		
5	9	9/24	Simulation modeling	Monday 9/30
	10	9/26 (Quiz)		
6	11	10/1	Coding practice	No exercises due this week
	12	10/3		
		10/8	Midterm exam	
Fall Break				
7	13	10/15	Introduction to optimization	Monday 10/21
	14	10/17		
8	15	10/22	Concrete formulation I	Monday 10/28
	16	10/24		
9	17	10/29	Concrete formulation II	Monday 11/4
	18	10/31		
10	19	11/5	Using the Gurobi solver	Tuesday 11/12
	20	11/7 (Quiz)		
11	21	11/12	Abstract formulation	Monday 11/18
	22	11/14		
12	23	11/19	Reusable software	Monday 12/2
	24	11/21 (Quiz)		
	25	11/26		
Thanksgiving break				
13	26	12/3	Problem solving practice	No exercises due this week
	27	12/5		
	Finals Week		Final exam: Friday Dec. 13, 11am-12:50pm. (Exam itself is 100 minutes)	

Notes:

- All of the in-class and homework exercises assigned during each week need to be submitted via Brightspace by 9am Pacific Time on the due date given in the last column.
- You should budget **at least 6 hours per week of out-of-class time** to complete the weekly exercises and to review the course material. In general, the university requires a minimum of two out-of-class hours of course work for every hour of in-class time: <https://arr.usc.edu/faculty-staff/classroom-scheduling/contact-hours/> (To achieve mastery, it is possible that the actual time spent may be more. **Please book an office-hour slot for extra help if you are struggling to complete the course material in a reasonable amount of time, and I will do all I can to help you learn more efficiently.**)