

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

Syllabus – Fall 2020 – 3.0 Units



Professor: Peng Shi

Email: pengshi@usc.edu

I'm committed to be as available as possible during this time of remote learning. **If you have any need, please reach out to me by email, and I will respond within 12 hours.**

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 portfolio optimization. This class is required for the Master of Science in Business Analytics program.

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:

Students must have access to a computer with reasonably fast Internet access. Moreover, the latest Anaconda distribution for Python 3.X should be installed, available at <https://docs.anaconda.com/anaconda/install/>. Using Anaconda to install Python, rather than using another method such as pip, will minimize technical difficulties later on. If you chooses to use Miniconda, which is the lite version of Anaconda, then you should make sure to install the packages numpy, scipy, matplotlib, pandas, jupyter, ipython, spyder, xlrd, and xlswriter. Further installation instructions are given on Blackboard under the "Getting Started" module.

Asynchronous Learning:

To maximize your learning experience in the online environment, I will be delivering this course asynchronously each week through a series of 5-15 minute videos on Blackboard, with an exercise after every video to give you immediate practice. You must submit each exercise before being able to watch the next video. Such hands-on experience is crucial for mastering programming and optimization modeling. Breaking up the content into short videos is intended to make difficult material easier to digest. Moreover, you can watch the videos at a time convenient to you and review each particular video as needed.

Communication Policy:

During the semester, I am committed to respond to your email within 12 hours, regardless of when it is sent. While I may respond much sooner, 12 hours is the length of time by which you can *expect* a response. The intent of this policy is to be inclusive to all students, regardless of what time zone you are in and what constraints you may have on schedule. If I cannot help you by email, I'm happy to set up a subsequent video chat using Zoom. I will also address the most common questions received each week via a Q & A video that I will post every Friday on Blackboard.

Supplementary Resources:

The content of the course is self-contained and are posted on Blackboard. However, students requiring extra help may find it helpful to review the following textbooks as well as the exercises therein:

- Chapters 1-9 of “Python for Everybody” by Charles R. Severance, available at <https://www.py4e.com/book.php>. (Both the PDF and HTML versions are free.)
- Chapters 5, 7-9 of “Data, Model, and Decisions: The Fundamentals of Management Science.” By Dimitris Bertsimas and Robert M. Freund, Dynamic Ideas, 2004. (ISBN-13: 978-0975914601 and ISBN-10: 097591460X) Available at the USC bookstore, on Amazon, or through the publisher.

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. A final letter grade will be assigned based on both your total number of points and how it compares to other students in the course.

Assessment	Description	Weight
Session Exercises	These are min-exercises that intersperse the session videos, and each exercise must be submitted before watching the next video. The exercises are graded based on timely completion and effort, rather than by correctness. In order to receive credit, you must submit all exercises for the given week by Friday 23:59 Pacific Time. You are not expected to be able to solve all exercises, but to demonstrate effort when you cannot solve a question, you should at least write something, either a partial solution or a description of your thinking process. No credit will be given if you leave large sections completely blank.	15%
Problem Sets	Apart from the session exercises, there is a set of exercises due every Monday, which gives you an opportunity to practice the concepts learned in the previous week. There are 10 problem sets, each worth 3.5% of course grade. The problem sets will be graded based on correctness.	35%
Exams	There are two exams, both of which are open-notes, open-computer, and are administered on Blackboard within a given 24 hour period (always from 00:00 to 23:59 Pacific Time). One can complete the exam anytime during this window, but once begun, there is a target time limit of 100 minutes for each exam. It is possible to go over this limit, but there will be grade deductions for every 5 minutes of overtime. While students can consult notes and online resource, they cannot ask anyone for help and cannot share answers with others. Each of the two exams is worth 25% of the course grade and each will cover material from half of the course.	50%
Total		100%

Exam Rescheduling:

Since the exams already allow a 24 hours period in which you can start the exam, I expect you to be able to complete each exam on the day it is scheduled. 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:

Unless otherwise noted, all problem sets and exams are due on Mondays at 23:59 Pacific Time, and must be submitted via Blackboard before the time it is due. Every problem set will be posted 10 days before it is due, so you should have enough time to complete them. If your Internet or Blackboard 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 Blackboard system will not accept submissions after the given timestamp. The purpose of this policy is so that the instructor can release the solutions of assignments immediately after they are due while the assignments 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.

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.

Students with Disabilities

USC is committed to making reasonable accommodations to assist individuals with disabilities in reaching their academic potential. If you have a disability which may impact your performance, attendance, or grades in this course and require accommodations, you must first register with the Office of Disability Services and Programs (www.usc.edu/disability). DSP provides certification for students with disabilities and helps arrange the relevant accommodations. 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. **This letter must be delivered to the professor by the end of the second week of class in order to apply accommodations for this course.** DSP is located in GFS (Grace Ford Salvatori Hall) 120 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776. Email: ability@usc.edu.

Academic Conduct:

Students are expected to make themselves aware of and abide by the University community's standards of behavior as articulated in the [Student Conduct Code](#). 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" <https://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>.

IMPORTANT: No communication between students is tolerated during an exam, and students cannot discuss exam questions with other students during the day of the exam. Any suspicion of plagiarism or cheating will be reported and investigated. Students are encouraged to report any suspicious behavior of peers; the identity of the student who reports cheating will be held confidential. **Any documented act of plagiarism or cheating will result at a minimum in a failing grade of "F" for all responsible parties and accomplices, and depending on the result of the investigation, may also result in higher penalties such as suspension or expulsion.** In order to uphold the academic integrity of the university, such disciplinary actions will be executed without mercy on the first violation. By USC policy, any student who is investigated for cheating will not be allowed by the system to drop the course.

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

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 and 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.

Campus Support & Intervention (CSI) – (213) 740-0411 – <https://campussupport.usc.edu/>
A team of professionals here to assist students, faculty, and staff in navigating complex issues. Whether you are here seeking support for yourself or someone else, we are available to help you problem solve, understand options, and connect with resources. Please note that we are not an emergency resource and are not available 24/7.

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. The university prohibits discrimination or harassment based on the following *protected characteristics*: race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and any other characteristic which may be specified in applicable laws and governmental regulations. The university also prohibits sexual assault, non-consensual sexual contact, sexual misconduct, intimate partner violence, stalking, malicious dissuasion, retaliation, and violation of interim measures.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298
usc-advocate.symplcity.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 Support and Advocacy – (213) 821-4710 – uscsa.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.

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	Date of Monday	Topic	Due Monday by 23:59 Pacific Time (PT)
1	8/17	Introduction to Python programming	Pre-course survey
2	8/24	Data structures and loops	Problem set 1
3	8/31	Algorithmic thinking I	Problem set 2
4	9/7	Algorithmic thinking II	Problem set 3
5	9/14	Simulation modeling	Problem set 4
6	9/21	Coding practice	Problem set 5
7	9/28	Introduction to optimization	
Exam 1 is to be taken on 10/5, during any 100-minute interval from 00:00 to 23:59 PT.			
8	10/5	Concrete formulation I	
9	10/12	Concrete formulation II	Problem set 6
10	10/19	Using the Gurobi solver	Problem set 7
11	10/26	Abstract formulation	Problem set 8
12	11/2	Reusable software	Problem set 9
13	11/9	Problem solving practice	Problem set 10
Exam 2 is to be taken on 11/23, during any 100-minute interval from 00:00 to 23:59 PT.			

Notes:

- All session exercises must be submitted by Friday 23:59 PT of each week to receive credit. These exercises are graded based on timely completion and effort, but not on correctness.
- Unless otherwise noted, all of the bolded items above are due on Monday 23:59 PT of each week.
- Unless there is a documented medical emergency, no late submissions are accepted.
- In each week, you should budget **at least 9 hours** to complete the lecture videos, session exercises, and problem sets. This level of minimum workload is mandated by USC policy: <https://arr.usc.edu/services/classroomscheduling/contacthours.html> (To achieve mastery, it is possible that the actual time spent may be more. **Please reach out to me 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.**)