LEHIGH UNIVERSITY

Course Syllabus
ISE 402: Applied Models in OR
Spring 2020

Course Information:

Lectures:	Wednesdays, 02:30pm-05:15pm, Mohler 401
Office Hours:	Tuesdays, 07:00pm-08:00pm, Mohler 475

Instructor Information:

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Description: This course covers applied models in operations research, including applications in supply chain, energy, healthcare, and disaster relief. Students will learn seminal models, theorems, and algorithms, and will gain experience in translating practical problems into mathematical ones. This course is required for first-year students in the ISE Ph.D. program.

Course Objectives: Students in this course will gain:

- a thorough understanding of problems faced by OR modelers and decision makers in public and private-sector organizations;
- skills in modeling real-world problems as quantitative, OR-based models;
- intuition about what makes models more or less tractable, and which algorithmic approaches may be more or less appropriate for a given model;
- an introduction to the key theoretical and analytical results that underlie the application of OR models in these fields.

Prerequisite Topics: ISE 406 and Stat 410.

Office Hours: Please come to office hours if you have any questions about the course. I am also available through e-mail (always) and on Google chat (often). If I do not respond to an e-mail within 24 hours, then please assume that I have not received it and send a follow-up e-mail. If I do not respond on Google chat, then I am either busy or you are contacting me too late in the day, in which case you can try again the next day (during work hours) or send an e-mail instead. I am also willing to meet at other times, but in such cases please e-mail me in advance to set up a mutually convenient time.

Course Site: Course material will be posted on Course Site. Important information, corrections, and updates about the course may also be sent by e-mail (via Course Site).

Textbook: There is no textbook for the course. Readings will be assigned from books and journal articles. These will be posted on Course Site. The *expected* readings are listed below.

References:

[1] S. Batun and M. A. Begen. Optimization in healthcare delivery modeling: Methods and applications. In B. T. Denton, editor, *Handbook of Healthcare Operations Management: Methods and Applications*, pages 75–119. Springer, New York, NY, 2013.

[2] D. Bertsimas, V. F. Farias, and N. Trichakis. Fairness, efficiency, and flexibility in organ allocation for kidney transplantation. *Operations Research*, 61(1):73–87, 2013.

[3] S. Creemers, M. Lambrecht, and N. Vandaele. Queuing models in healthcare. *Tijdschrift voor economie en management (Review of Business and Economics)*, 52(3):471–497, 2007.

[4] G. Gallego and I. Moon. The distribution free newsboy problem: Review and extensions. *The Journal of the Operational Research Society*, 44(8):825–834, 1993.

[5] D. Gupta. Queueing models for healthcare applications. In B. T. Denton, editor, *Handbook of Healthcare Operations Management: Methods and Applications*, pages 19–44. Springer, New York, NY, 2013.

[6] L. A. McLay. Discrete Optimization models for homeland security and disaster management. In D. Aleman and A. Thiele, editors, *INFORMS Tutorials in Operations Research*, pages 111–132. INFORMS, Hanover, MD, 2015.

[7] L. V. Snyder and Z.-J. M. Shen. *Fundamentals of Supply Chain Theory*. Wiley, Hoboken, NJ, second (draft) edition, 2019.

[8] J. A. Taylor. *Convex Optimization of Power Systems*. Cambridge University Press, Cambridge, 2015.

Expected Schedule:

Week	Dates	Lecture Topic(s)	Note(s)
1	01/22	Modeling basics	
2	01/29	Inventory optimization	
3	02/05	Inventory optimization	
4	02/12	Facility location	
5	02/19	Facility location	
6	02/26	Healthcare	
7	03/04	Healthcare	Midterm
8	03/11	[No class]	Spring Break
9	03/18	Healthcare	
10	03/25	Power Systems	
11	04/01	Power Systems	
12	04/08	Disaster Relief	Reschedule 04/10(?)
13	04/15	Disaster Relief	
14	04/22	Student lectures	
15	04/29	Student lectures	
16			Final

LaTeX: All work must be submitted as documents produced with LaTeX. There are no exceptions to this requirement. Assistance for learning LaTeX will be given in the form of the source for documents produced for the course, if requested. I can also provide a template for homework solutions. It is not required that you use the provided template, but it is recommended if you are unfamiliar with LaTeX.

Grading: Your grade will be calculated as follows.

Homework:	20%
Midterm Exam:	25%
Lecture:	20%
Final Exam:	25%
Participation:	10%

Homeworks: There will be regular homework assignments throughout the semester, generally assigned and due every few weeks. Each homework must be submitted electronically via Course Site. No credit will be given for any late assignment. You are free to consult with other students when working on homeworks, but the work you submit must be your own. *Please cite any references you use, including fellow students.* Your homework grade will be determined by the number of points you accumulate over the entire semester as compared to the maximum number of points that are possible to accumulate. In this manner, homeworks with more questions will effectively have a higher weight in determining your homework grade.

Exams: Both exams will be cumulative, in-class, *written* exams.

Lecture: With another student (or students), each of you will prepare a lecture for the end of the semester. The lecture will involve you and your team members researching appropriate source material, preparing lecture materials, and presenting to the class.

Participation: The lectures for the course are meant to be interactive, and participation will factor into your grade. If you are unable to attend a lecture, then please let me know in advance. If you miss multiple lectures without sufficient reason, then your participation grade will suffer.

Collaboration Policy: The sharing of ideas is educationally useful and you are encouraged to discuss assignments with other students. However, *plagiarism* of any kind is destructive, fraudulent, and unacceptable. You are *strictly* forbidden to copy another student's written work, whole or in part, and submit that work under your name. You are also *strictly* forbidden to make trivial or mechanical changes to another student's written work and submit that work under your name. Note that while electronic plagiarism is easier to perform (via copy-and-paste), it is also easier to detect. Plagiarized work will receive no credit and repeat offenses will result in more severe action. A sure way to avoid this issue is to discuss the assignments with fellow students, but then write your solutions individually and independently.

Emergencies: Everyone is responsible for all material covered and announcements made in lecture. If you believe you will miss a long period of time in the course due to illness, a family emergency, etc., then please contact me as early as possible. Under no circumstances will credit be given for missed work unless you have discussed your absence with me in advance.

Regrade Requests: If you disagree with a grade you receive, then you may submit a regrade request. This request must be written and submitted no more than 48 hours after you receive the grade.

Recording Devices: Voice and/or video recording devices may be used only with the approval of everyone in the classroom. Please let me know in advance if you wish to use these types of devices.

Accommodations for Students with Disabilities: If you have a disability for which you are or may be requesting accommodations, please contact me and the Office of Academic Support Services, Williams Hall, Suite 301 (+1 (610) 758-4152) as early as possible in the semester. You must have documentation from the Academic Support Services office before accommodations can be granted.

The Principles of Our Equitable Community: Lehigh University endorses The Principles of Our Equitable Community (http://www.lehigh.edu/~inprv/initiatives/PrinciplesEquity_Sheet_v2_032212.pdf). We expect each member of this class to acknowledge and practice these Principles. Respect for each other and for differing viewpoints is a vital component of the learning environment inside and outside the classroom.