IVEY PhD
Business School
WESTERN UNIVERSITY · CANADA

COURSE SYLLABUS

Business 9802 – Management Science I
Fall 2025

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Tuesdays 1:00 p.m. – 4:00 p.m.
(12 Sessions)

INTRODUCTION
Welcome to Bus 9802 Management Science I -- Deterministic Optimization.

COURSE DESCRIPTION
This is the first part of the Management Science foundation series focusing on mathematical modeling and deterministic optimization. Students will learn technical topics including optimization, linear programming, stochastic processes, game theory, dynamic programming, non-linear programming, integer programming. In addition, students will also learn applications of the techniques and tools (e.g. revenue management), and how to identify, formulate, and investigate a research problem which can be analyzed through mathematical modeling.

LEARNING OUTCOMES/OBJECTIVES
(1) To understand how to formulate a mathematical model of problem statement/description.
(2) To gain a foundation in deterministic optimization.
(3) To critically read and analyze published research papers and applied articles.
(4) To learn coding of optimization problems in Excel and Python, and possibly Cplex, etc.

METHODS OF EVALUATION

30% Class Contribution
30% Assignment Questions
40% Report & Presentation: Literature Review

Class Contribution:
Students are expected to actively participate and contribute to the class-room discussion. Students are therefore required to have read the required reading and prepared questions and discussion points to share with their classmates. Each week we will discuss either a technical research paper or an applied article; see list below. Students will be assigned to lead 1-2 80 minute class-discussions. The discussion should include a description of the problem, motivation, very brief literature review, model framework, assumptions, analysis/results explanation, and future work or extensions.

Lateness, get up and leave during class, inappropriate use of the wireless network, txt-ing, playing video games during class and other disruptive behaviors are considered inappropriate and WILL RESULT in a negative in-class contribution mark at the Professor's discretion.

Attendance in all class sessions is mandatory. If you are sick -- needless to say -- you should stay home. In which case and to the extent possible, email the Professor before to let them know. No need to submit proof from a medical or healthcare worker (Doctor or Nurse). Per university policies, to pass the course, students can at most be absent 25% of the time, i.e. 3 classes.

Assignment Questions:
Each week students will be given a set of questions, some are from Hillier & Lieberman and some are made by the Professor. Some of the assignments will require coding in Python for solving numerical optimization problems. Details posted on Learn and in class.

Students are required to turn in the assignments in within 1 week; deadlines posted on Learn. Late assignments are penalized as follows: 1 day late, 10%pts deduction; 2 days late, 25%pts deduction, 3 days late, 40%pts deduction, 4+ days, 60%pts deduction.

Term Report (50%) & Presentations (50%):
Each student will read and report on a *recent* article from the journal Optimization Letters; must be published in last 15 years (2010 – 2025). One student per article -- *first come, first choice*.

The objective of the project is to (a) understand the paper (problem description and model formulation) and discuss its position and contribution to the topics covered in class; (b) propose a technical extension and/or additional formal result with formal proof; and (c) code a numerical illustration in Python (or Cplex or Gurobi or any Optimization software of choice), this can be done on simulated data, i.e. "fake". Ask the professor if you have any questions.

There are no specific formatting requirements for the written report or presentations. The guiding principle is to make it clear and professional looking. Feel free to ask the Professor for feedback on ideas and drafts.

You are allowed to use ChatGPT and alike GenAI engines to understand the article, brainstorm ideas, generate code for the numerical illustration. However, **ALL WRITTEN MATERIAL IN THE REPORT AND ALL SLIDES AND ALL MATERIAL PRESENTED ORALLY IN CLASS MUST BE STUDENTS OWN AND NOT GENERTATED BY CHATGPT, ETC.** See below for GenAI policy and if you have questions as the professor.

Deadlines:
Email the Professor your choice of Optimization Letter article no later than Tuesday September 30th.
Each student presents a 10 minute introduction and overview of article on Tuesday October 21st.
Each student presents a 30 minute final presentation on Tuesday December 2nd.
Each student submits a ~5 page term report no later than Tuesday December 16th .
Lateness penalized as follows: 1 day late, 10%pts deduction; 2 days late, 25%pts deduction, 3 days late, 40%pts deduction, 4+ days, 60%pts deduction.

MATERIALS/REQUIRED READING

The text-book for this course will be Introduction to Operations Research by Hillier & Lieberman. There are multiple versions and different editions. They are more or less the same. Look at the content and chapter topic for the relevant weekly reading. See table below.

In addition, each week there will also be an article assigned. See table below.

All readings are mandatory.

COURSE TIMELINE AND FORMAT

All sessions are in-person only. Each 3-hour session will be split into 2 roughly 80-minute parts, with a 15-minute break. See below for the schedule of content.

USE OF GENERATIVE ARTIFICIAL INTELLIGENCE (AI)

Use of ChatGPT, or any generative artificial intelligence (AI) tools/software/apps, is permitted and highly encouraged for the following activities: understanding the articles, explaining the concepts, generating code for solving homework assignments, help solving homework assignments, conducting a literature search.

It is **NOT** acceptable to have GenAI generate any written material submitted for homework.
It is **NOT** acceptable to have GenAI generate the script or remarks you intend to orally present in class. Part of the training as a scholar is communication and to that extent it is imperative that you learn to express and explain Analytics, Operations Research, Quantitative Modeling in your own words.

If you have doubts ask the Professor BEFORE you use GenAI tools to help you.

LEARNING TOOLS AND RESOURCES

Feel free to make use of any online resource you find helpful, including GenAI tools (see previous point). Connect with Western Libraries for strategies searching data-bases and articles. The Learning Skills Services and the Writing Support Centre are good options for self-guided learning.

ENROLLMENT RESTRICTIONS

Enrollment in this course is restricted to graduate students in the Ivey PhD Program, as well as any student that has obtained special permission to enroll in this course from the course instructor as well as the Graduate Chair (or equivalent) from the student's home program.

ACADEMIC OFFENCES: PLAGIARISM AND ACADEMIC INTEGRITY

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_grad.pdf.

All required papers may be subject to submission for textual similarity review to the commercial plagiarism-detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (http://www.turnitin.com).

GENDER-BASED SEXUAL VIOLENCE SUPPORT

Western is committed to reducing incidents of gender-based and sexual violence (GBSV) and providing compassionate support to anyone who is going through or has gone through these traumatic events. If you are experiencing or have experienced GBSV (either recently or in the past), you will find information about support services for survivors, including emergency contacts at the following website: https://www.uwo.ca/health/student_support/survivor_support/get-help.html. To connect with a case manager or set up an appointment, please contact support@uwo.ca.

HEALTH AND WELLNESS SERVICES

As part of a successful graduate student experience at Western, we encourage students to make their health and wellness a priority. Western provides several on campus health-related services to help you achieve optimum health and engage in healthy living while pursuing your graduate degree. See https://www.uwo.ca/health.

Students who are in emotional/mental distress should refer to Mental Health Support at https://www.uwo.ca/health/psych/index.html for a complete list of options about how to obtain help. Additionally, students seeking help regarding mental health concerns are advised to speak to someone they feel comfortable confiding in, such as their faculty supervisor, their program director or program coordinator.

ACCESSIBLE EDUCATION WESTERN

Western is committed to achieving barrier-free accessibility for all its members, including graduate students. As part of this commitment, Western provides a variety of services devoted to promoting, advocating, and accommodating persons with disabilities in their respective graduate program.

Graduate students with disabilities (for example, chronic illnesses, mental health conditions, mobility impairments) are strongly encouraged to register with Accessible Education Western (AEW), a confidential service designed to support graduate and undergraduate students through their academic program. With the appropriate documentation, the student will work with both AEW and their graduate programs (normally their Graduate Chair and/or Course instructor) to ensure that appropriate academic accommodations to program requirements are arranged. These accommodations include individual counselling, alternative formatted literature, accessible campus transportation, learning strategy instruction, writing exams and assistive technology instruction.

A FINAL WELCOME AND REQUEST OF STUDENTS

I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability, and other visible and nonvisible differences. I consider this classroom to be a place where you will be treated with respect. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class. If it is appropriate to our learning and you feel comfortable doing so, I ask that you share your unique point of view as we explore the course content.

Course Material: (the listed material are all REQUIRED)

Hillier & Lieberman "Introduction to Operations Research" (9th Edition – or any edition)

Note that each student is responsible for retrieving the articles themselves.

[1] Optimization: From Its Inception, Thomas L. Magnanti, Management Science Vol. 67, No. 9, 2021

https://pubsonline.informs.org/doi/10.1287/mnsc.2021.3955

[2] Robust Storage Assignment in Unit-Load Warehouses, Marcus Ang, Yun Fong Lim, Melvyn Sim, Management Science Vol. 58, No. 11, 2012

https://pubsonline.informs.org/doi/10.1287/mnsc.1120.1543

[3] Amazon Locker Capacity Management, Samyukta Sethuraman, Ankur Bansal, Setareh Mardan, Mauricio G. C. Resende, Timothy L. Jacobs, INFORMS JOURNAL ON APPLIED ANALYTICS, Vol. 54, No. 6, 2024

https://pubsonline.informs.org/doi/epdf/10.1287/inte.2023.0005

[4] (a) Modelling to optimise consumptive use of game, John W. Hearne, Jan L. Korrûbel, Kathryn J. Koch, Annals of Operations Research, vol. 95, issue 1, 2000

https://www.lib.uwo.ca/cgi-bin/ezpauthn.cgi?url=http://search.proquest.com/scholarly-journals/modelling-optimise-consumptive-use-game/docview/214512408/se-2?accountid=15115

(b) Craggier National Park, Chris K. Anderson, and Benjamin Marcus, Ivey Publishing Case (9B03E001), 2003

[5] At What Cost do we Reduce Pollution? Shadow Prices of SO2 Emissions, John R. Swinton, The Energy Journal, vol. 19, issue 4, 1998

https://www.jstor.org/stable/41322804?seq=1

[6] Scheduling the Chilean Soccer League by Integer Programming, Guillermo Durán, Mario Guajardo, Jaime Miranda, Denis Sauré, Sebastián Souyris, Andres Weintraub, Rodrigo Wolf, Interfaces, Vol. 37, No. 6, 2007

https://pubsonline.informs.org/doi/10.1287/inte.1070.0318

[7] Decarbonizing Distribution Networks through Emissions-Efficient Logistics, Anthony McCreery, and Fredrik Odegaard, pending submission, 2025

[8] The flying sidekick traveling salesman problem: Optimization of drone-assisted parcel delivery, Chase C. Murray, and Amanda G. Chu, Transportation Research Part C: Emerging Technologies, Vo. 54, 2015

https://www.sciencedirect.com/science/article/abs/pii/S0968090X15000844?via%3Dihub

[9] Vaccination and the theory of games, Chris T. Bauch, David J.D. Earn, *Proceedings National Academy Science*, Vol. 101, No. 36, 2004

https://www.pnas.org/doi/full/10.1073/pnas.0403823101

[10] Choice-Based Dynamic Pricing for Vacation Rentals. Yaping Wang, Kelly McGuire, Jeremy Terbush, Michael Towns, Chris K. Anderson, INFORMS JOURNAL ON APPLIED ANALYTICS, Vol. 51, No. 6, 2021

https://pubsonline.informs.org/doi/epdf/10.1287/inte.2021.1075

[11] Productivity Growth, Technical Progress, and Efficiency Change in Industrialized Countries, Rolf Färe, Shawna Grosskopf, Mary Norris, Zhongyang Zhang, The American Economic Review, Vol. 84, No. 1, 1994

https://www.jstor.org/stable/2117971?seq=1

COURSE OVERVIEW: FALL 2025 – Deterministic Modeling

Week	Date	Topic	H&L (9th ed.)	Article	Lead
1	Sep 9	Intro to OR & Modeling	Ch. 1, 2, 3	Optimization: From….	
2	Sep 16	Linear Programming	Ch. 3, 4	Robust Storage…	?
3	Sep 23	Simplex Method	Ch. 4 & 5	Amazon Locker…	?
-	Sep 30	NO CLASS	National Day for Truth and Reconciliation (NDTR)		
4	Oct 7	Duality	Ch. 6	Consumptive Game…	?
5	Oct 14	Duality	Ch. 6	Cost Reduce Pollution...	?
6	Oct 21	Integer Programming	Ch. 11	Scheduling Chilean…	?
7	Oct 28	Transportation	Ch. 8	Decarbonizing Distribution…	?
8	Nov 4	Network Optimization	Ch. 9	Flying Sidekick TSP…	?
9	Nov 11	Game Theory	Ch. 14	Vaccination…	?
10	Nov 18	Nonlinear Programming	Ch. 12	Choice-Based Dynamic…	?
11	Nov 25	Data Envelopment Analysis		Productivity Growth…	?
12	Dec 2	Term Projects Presentations	-	-	