

MAST 324
Introduction to Optimization
Winter 2023

Note: This course will be delivered in person. All course material, including announcements, will be posted on Moodle.

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Note: The system does not allow one to reply to emails received from Moodle. If you write, please do so from your own email account.

Lectures: Tuesdays and Thursdays, 8:45–10:00 AM.

Office Hours: Tuesdays, 10:30–12:00 PM.

Textbook: *Operations Research: Applications and Algorithms*, by Wayne L. Winston, Brooks/Cole, 4th Edition.
The digital and print version of the textbook will be available at:
<https://www.bkstr.com/concordiastore/home>
Note: Students should order textbooks as early as possible, especially for print versions in case books are backordered or there are any shipping delays.

Recommended Text: *Operations Research: An Introduction*, by Hamdy A. Taha, Pearson, 10th Edition.

Assignments: Assignments are very important as they indicate the level of difficulty of the problems that students are expected to solve and understand independently. Students are expected to submit assignments weekly as a single PDF file on Moodle site. Solutions must be written up carefully, showing all work for full credit. **Late assignments will not be accepted.**

Mid-Term Test: There will be one midterm during lecture time in week 7 or 8, covering material of the first 6 weeks of the course.

PLEASE NOTE: It is the Department policy that tests missed for any reason, including illness, cannot be made up. If you miss a test, the Final Exam will count for 80% of your final grade.

Final Exam: At the end of course, there will be final examination during the period assigned by Concordia's Exam Office. It will cover material from the entire course.

PLEASE NOTE: Students are responsible for finding out the date and time of the final exam once the schedule is posted by the Examination Office. Any conflicts or problems with the scheduling of the final exam must be reported directly to the Examination Office, **not** to your instructor. It is the Department's policy and the Examination Office's policy **that students are to be available until the end of the final exam period. Conflicts due to travel plans will not be accommodated.**

Final Grade: The final grade will be the higher of (a) or (b):
(a) 20% Assignments, 20% Midterm test, 60% Final Exam.
(b) 20% Assignments, 80% Final Exam.

If the grading scheme for this course includes graded assignments, a reasonable and representative subset of each assignment may be graded. Students will not be told in advance which subset of the assigned problems will be marked and should therefore attempt all assigned problems.

Calculators: Only calculators approved by the Department (with a sticker attached as a proof of approval) are permitted for the class test and final examination. For a list of Approved and Not-approved calculators see www.concordia.ca/artsci/math-stats/services.html

Plagiarism: Cases of plagiarism (including the assignments, the mid-term test and the final exam) will be treated according to the University policy.

Topics to be covered:

Section	Topics
3.1	What Is a Linear Programming Problem?
3.2	The Graphical Solution of Two-Variable linear Programming Problems
3.3	Special Cases
3.4	A Diet problem
3.5	A Work Scheduling Problem
3.8	Blending Problem
4.1	How to Convert an LP to Standard Form
4.2	Preview of the Simplex Algorithm
4.3	Direction of Unboundedness
4.4	Why Does an LP have an Optimal bfs?
4.5	Simplex Algorithm
4.6	Using Simplex Algorithm to Solve Minimization Problems
4.7	Alternative Optimal Solutions
4.8	Unbounded LPs
4.11	Degeneracy and Convergence of the Simplex Algorithm

4.12	The Big M Method
4.13	The Two-Phase Simplex Method
4.14	Unrestricted in Sign Variables
6.1	A Graphical Introduction to Sensitivity Analysis
6.2	Some Important Formulas
	Review
	Class Test (weeks 1 – 6)
6.3	Sensitivity Analysis
6.5	Finding the Dual of an LP
6.6	Economic Interpretation of the Dual problem
6.7	The Dual Theorem and its Consequences
6.8	Shadow Prices
6.9	Duality and Sensitivity Analysis
6.11	The Dual Simplex Method
7.1	Formulating Transportation Problems
7.2	Finding Basic Feasible Solutions for Transportation problems
7.3	The Transportation Simplex Method
7.4	Sensitivity Analysis for Transportation Problem
	Review

Academic Integrity and the Academic Code of Conduct

This course is governed by Concordia University's policies on Academic Integrity and the Academic Code of Conduct as set forth in the Undergraduate Calendar and the Graduate Calendar. Students are expected to familiarize themselves with these policies and conduct themselves accordingly. "Concordia University has several resources available to students to better understand and uphold academic integrity. Concordia's website on academic integrity can be found at the following address, which also includes links to each Faculty and the School of Graduate Studies: concordia.ca/students/academic-integrity." [Undergraduate Calendar, Sec 17.10.2]

Use of Zoom

Note: Zoom is included as an institutionally-approved technology. This means we have been assured of the privacy protections needed to use freely within the classroom)

Zoom might be used in this course to facilitate learning at a distance. It may be used to record some or all of the lectures and/or other activities in this course. If you wish to ensure that your image is not recorded, speak to your instructor as soon as possible.

Also, please note that you may not share recordings of your classes and that the instructor will only share class recordings for the purpose of course delivery and development. Any other sharing may be in violation of the law and applicable University policies, and may be subject to penalties.

Behaviour

All individuals participating in courses are expected to be professional and constructive throughout the course, including in their communications.

Concordia students are subject to the [Code of Rights and Responsibilities](#) which applies both when students are physically and virtually engaged in any University activity, including classes, seminars, meetings, etc. Students engaged in University activities must respect this Code when engaging with any members of the Concordia community, including faculty, staff, and students, whether such interactions are verbal or in writing, face to face or online/virtual. Failing to comply with the Code may result in charges and sanctions, as outlined in the Code.

Intellectual Property

Content belonging to instructors shared in online courses, including, but not limited to, online lectures, course notes, and video recordings of classes remain the intellectual property of the faculty member. It may not be distributed, published or broadcast, in whole or in part, without the express permission of the faculty member. Students are also forbidden to use their own means of recording any elements of an online class or lecture without express permission of the instructor. Any unauthorized sharing of course content may constitute a breach of the [Academic Code of Conduct](#) and/or the [Code of Rights and Responsibilities](#). As specified in the [Policy on Intellectual Property](#), the University does not claim any ownership of or interest in any student IP. All university members retain copyright over their work.

Extraordinary circumstances

In the event of extraordinary circumstances and pursuant to the [Academic Regulations](#) the University may modify the delivery, content, structure, forum, location and/or evaluation scheme. In the event of such extraordinary circumstances, students will be informed of the change.