

Dalhousie University
Faculty of Science
Department of Mathematics and Statistics
Math 3300-Optimization
Fall 2020
Asynchronous online class

Instructor: Leila Mohammadi (she/her/hers)

e-mail: Leila.mohammadi@dal.ca (Expect a response withing 24 hours)

Office hours: Via Collaborate Ultra, schedule TBD based on the survey

TA: Fatma Sarhan (ft971435@dal.ca)

Class Time: TR 4:05-5:25 pm (ADT)

Course Delivery: This course will be delivered fully asynchronous through Brightspace. There will be no live lectures. The pre-recorded lectures and any course materials will be posted gradually on Brightspace according to the class official schedule (TR 4:05-5:25 pm) each week. All assignments, quizzes and the final exam will be available and submitted through Brightspace.

Course Description

An introduction to the concepts and applications of linear programming. Topics include the simplex method for linear programming, duality and sensitivity analysis. Some of these topics are illustrated by means of interactive computer packages.

Course Prerequisites

A passing grade in MATH 1030.03.

Learning Objectives/Outcomes

This course presents the theory, application, and algorithms relevant to solving linear programming problems. In this course, students will achieve the following outcomes:

Student will:

- Be able to mathematically formulate an applied word problem involving revenue, costs, and constraints as a linear program.
- Be able to geometrically solve a linear program in two variables.
- Be able to convert a linear programming problem into standard form.
- Be able to apply the simplex algorithm to solve a linear programming problem.
- Be able to find alternate solutions to a linear program problem.
- Be able to utilize computer software to solve a linear programming problem.
- Be able to solve a linear programming problem using either the M-Method or the Two-Phase Simplex Method.
- Be able to solve a linear programming with unrestricted-in-sign variables.
- Be able to analyze small changes to a linear programming problem.
- Be able to produce the dual of a linear program.
- Be able to describe the Dual Theorem and its consequences.

- Be able to use shadow prices to analyze changes to a linear programming problem's optimal solution.
- Be able to use duality to analyze changes to a linear programming problems

Course Materials

- Course textbook: *Operations Research: applications and Algorithms (4th Ed.)* by W. L. Winston, Brooks/Cole, Belmont, 2004
- **Brightspace:** This course will operate entirely on Brightspace. To access your Math 3300 course on Brightspace you may login to: <https://dal.brightspace.com/d2l/login>. Alternatively, you can select the Brightspace link that appears on the Dalhousie homepage (<http://www.dal.ca>). It is important that you familiarize yourself with the systems requirement for proper access to Brightspace.
- **Webwork:** Some of weekly quizzes and assignments may be through WeBWorK, accessed through links appearing under Content in Brightspace.

Course Resources

- **Pre-Recorded Videos:** Lecture-style presentations of the sections in the textbook and course notes, recorded using Panopto accessed through Brightspace
- **Discussion Board:** The link and detailed instructions will be announced later in the course as an announcement.
- **TA Online Support:** The link and TA schedule will be announced later on Brightspace.

Course Content

The course will be structured into the following weeks.

Date	Topics
Week 1 (Sep 8- Sep 11)	2.1-2.6: Review of Basic Linear Algebra,
Week 2 (Sep 14-Sep 18)	3.1: What is a linear programming problem? 3.2: The graphical solution of two-variable linear programming problems, 3.3: Special cases,
Week 3 (Sep 21-Sep 25)	3.4: a diet problem, 3.5: a work-scheduling problem, 3.8: Blending problems,
Week 4 (Sep 28-Oct 2)	4.1: How to convert an LP to standard form continued, 4.2: Preview of the simplex algorithm, 4.5: Simplex algorithm, 4.6: using the simplex algorithm to solve minimization problems
October 2	Last day to drop the course without a W
Week 5 (Oct 5-Oct 9)	4.7: Alternative optimal solutions,

	4.8:direction of unboundedness, and unbounded LPs
October 12	Thanksgiving- No Class
Week 6 (Oct 13- Oct 16)	4.12: The Big M method 4.13:The two-phase simplex method,
Week 7 (Oct 19-Oct 23)	6.1:A graphical introduction to Sensitivity Analysis, 6.2:Some important formulas
Week 8 (Oct 26-Oct 30)	6.2:Some important formulas continued Midterm Exam
November 2	Last day to drop the course with a W
Week 9 (Nov 2-Nov 6)	6.3:Sensitivity Analysis 6.5:Finding the Dual of an LP,
Nov 9-Nov 13	Fall Study Break -No Class
Week 10 (Nov 16-Nov 20)	6.7:the dual theorem and its consequences 6.8:Shadow prices, 6.9: Duality and Sensitivity Analysis
Week 11 (Nov 23-Nov 27)	9.1:Introduction to Integer Programming, 9.2:Formulating Integer Programming problems
Week 12 (Nov 30-Dec 4)	9.3:The Branch-and-Bound method for solving pure integer programming problems, 9.5:Solving Knapsack problems by the Branch-and-Bound method
Week 13 (Dec 7-Dec 8)	Review

Course Assessment

Component	Weight (% of final grade)	Frequency/Date
Weekly Quizzes	%15	Weekly
Four Assignments	%20	Roughly every three weeks
Midterm Exam	%30	October 27
Final Exam	%35	Scheduled by Registrar Office
Introductions (Bonus)	%1	Week 1
self-assessment (Bonus)	%2	Week 1

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (<50)
A- (80-84)	B- (70-72)	C- (55-59)	

Course Policies

- All opening/available times and all closing/due times announced in the course will be at Atlantic time. Please make sure you are aware of how this time zone translates to your time zone.
- It is the student's responsibility to go through all of the required material each week and submit their assessments on time. There will be live office hours as well as TA support available throughout the entire course.
- Instructor will post announcements on course Brightspace to inform students about the course. It is students' responsibility to make sure that they have read carefully all the posted announcements.
- Students are expected to take responsibility for progressing through the online course material (completing assignments, lecture videos, taking weekly tests, etc.) in a timely fashion. They should follow the posted schedule/timeline.
- Students need to complete each assignment and quiz on time to insure they build up the necessary skills for the upcoming tasks.
-
- Assignments will be available on the course Brightspace two weeks prior to their due dates. The due date will be as announced for each assignment separately. The late assignments are accepted within 48 hours of the due date. A 15% deduction (from the total weight of the assignment) will be applied as a penalty. Any late submissions must be informed to the instructor 24 hours prior to the due date.
- Missed assignment will be counted as zero. Exceptions are made for medical reasons.
- If a student misses an assignment due to a medical reason, they must inform the instructor via email at least an hour prior to the due date and a 72-hour extension will be granted without penalty. The student must submit a Student Declaration of Absence form with their assignment. This is not an option for a late assignment.
- The Student Declaration of Absence can be used **only twice** during the course. Consult the following link for more information on the Student Declaration of Absence.
- https://www.dal.ca/dept/university_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.html
- Each weekly quiz tests the material of its corresponding week. Details TBA.
- There will be no makeup midterm or test. If you miss the midterm without prior permission, then it will count as a zero. Exceptions are made in case of illness or family emergencies. You must notify the instructor at least one hour prior to the midterm/test and submit a Student Declaration of Absence form in medical cases. In these cases, the weight of the missed midterm/test will be shifted to the final exam (so, for example, your final exam will be worth 65% of your final grade if you miss the midterm).
- The final exam will be scheduled by registrar office. It is up to the discretion of the instructor to use remote proctoring in online testing. Students may be required to download proctoring software onto their devices. Students who cannot meet system requirements for remote proctoring should contact the instructor for an alternate



assessment. (Typical system requirements are: (i) Mac OS or Windows, (ii) a web-cam, and (iii) an internet connection.)

- It will not be possible to write the final exam early. There will only be a make-up of the final exam in case of illness or family emergencies. The instructor must be informed of your absence at least an hour prior the exam is available. A Student Declaration of Absence form must be submitted in medical cases.
- Office hours will be held on Collaborate Ultra found in BrightSpace.
- All questions regarding this course content, assignments or tests must be asked on the BrightSpace discussions threads. Please read all previously asked questions before you post. The questions will be answered within 24 hours during the weekdays.
- You may contact the instructor via email to request an appointment, inform her of your absence and obtain an extension on the assignment or other personal matters.
- The students are strongly advised to educate themselves about Brightspace.
- **Academic integrity is very important. Plagiarism and cheating will not be tolerated.** Students are expected to only submit their own work reflecting their personal and individual effort. Any violation may result in disciplinary measures initiated by the instructor. **Please study the following webpage to learn more about plagiarism to avoid his serious offence.**
- https://www.dal.ca/dept/university_secretariat/academic-integrity/plagiarism-cheating.html
- **Plagiarism is only one type of academic dishonesty. The Academic Calendar also identifies other types of cheating including:**
https://www.dal.ca/dept/university_secretariat/academic-integrity/plagiarism-cheating/other-cheating.html
- **Copy Right Policy:** The course material in course Brightspace is posted for your personal educational use only. Copying course material from this site for distribution (e.g. uploading material to a commercial third-party or public website, or otherwise sharing these materials with people who are not part of the class) outside of this site may be a violation of Copyright law. If you have questions regarding the use of materials from this site, please contact the instructor/course administrator. If you have questions regarding copyright, please contact the Copyright Office (copyright.office@dal.ca)

Faculty of Science Course Syllabus (Section B) (revised June-2020)**Fall 2020**

Math 3300-optimization

University Policies and Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate

Missed or Late Academic Requirements due to Student Absence

As per Senate decision instructors may not require medical notes of students who must miss an academic requirement, **including the final exam**, for courses offered during fall or winter 2020-21 (until April 30, 2021).

Information on regular policy, including the use of the Student Declaration of Absence can be found here:

https://www.dal.ca/dept/university_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.html

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.

Information: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia).

Information: https://www.dal.ca/campus_life/academic-support/accessibility.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution.

Code: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness

Statement: <http://www.dal.ca/cultureofrespect.html>

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit or e-mail the Indigenous Student Centre (1321 Edward St) (elders@dal.ca).

Information: https://www.dal.ca/campus_life/communities/indigenous.html

Important Dates in the Academic Year (including add/drop dates)
https://www.dal.ca/academics/important_dates.html

University Grading Practices

https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

Student Resources and Support

Advising

- **General Advising** https://www.dal.ca/campus_life/academic-support/advising.html
- **Science Program Advisors:** <https://www.dal.ca/faculty/science/current-students/academic-advising.html>
- **Indigenous Student Centre:** https://www.dal.ca/campus_life/communities/indigenous.html
- **Black Students Advising Centre:** https://www.dal.ca/campus_life/communities/black-student-advising.html
- **International Centre:** https://www.dal.ca/campus_life/international-centre/current-students.html

Academic supports

- **Library:** <https://libraries.dal.ca/>
- **Writing Centre:** https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html
- **Studying for Success:** https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html
- **Copyright Office:** <https://libraries.dal.ca/services/copyright-office.html>
- **Fair Dealing Guidelines:** <https://libraries.dal.ca/services/copyright-office/fair-dealing.html>

Other supports and services

- **Student Health & Wellness Centre:** https://www.dal.ca/campus_life/health-and-wellness/services-support/student-health-and-wellness.html
- **Student Advocacy:** <https://dsu.ca/dsas>
- **Ombudsperson:** https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

Safety

- **Biosafety:** <https://www.dal.ca/dept/safety/programs-services/biosafety.html>
- **Chemical Safety:** <https://www.dal.ca/dept/safety/programs-services/chemical-safety.html>
- **Radiation Safety:** <https://www.dal.ca/dept/safety/programs-services/radiation-safety.html>
- **Scent-Free Program:** <https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html>