Math 3300 Optimization Syllabus
Department of Mathematics
Math 3300 Fall 2023

Dalhousie University acknowledges that we are in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq People and pays respect to the Indigenous knowledges held by the Mi'kmaq People, and to the wisdom of their Elders past and present. The Mi'kmaq People signed Peace and Friendship Treaties with the Crown, and section 35 of the Constitution Act, 1982 recognizes and affirms Aboriginal and Treaty rights. We are all Treaty people.

Dalhousie University also acknowledges the histories, contributions, and legacies of African Nova Scotians, who have been here for over 400 years.

Course Instructor(s)

Name	Email	Office Hours
Nicholas Layden	Nicholas.layden@dal.ca	TBD

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

Math 1030 or Math 2030.

Course Exclusions

None.

Student Resources

Students are free to utilize office hours, or the Learning Center in Chase 001 for additional help.

Course Structure

Course Delivery

In-Person Only, with assignment components given on brightspace.

Lectures

Tuesday, Thursday - 11:35AM - 12:55PM

LSC-Psychology - P4260

Laboratories

None

Tutorials

None

Course Materials

Course Textbook: *Operations Research: Applications and Algorithms (4th ed.)* by W.L. Winston, Brooks/Cole, Belmont, 2004.

Course will have a brightspace page.

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Assessment

Assessment Type	Weight	Due Date(s)
Assignments	35%	September 21, October 12, October 26, November 16, November 30. Start of Class Period.
Midterm	25%	Thursday, November 2, during class.
Final Exam	40%	Scheduled Exam Period

Conversion of numerical grades to final letter grades follows the
[Dalhousie Grade Scale](#)

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (0-49)
A- (80-84)	B- (70-72)	C- (55-59)	

Course Policies on Missed or Late Academic Requirements

No late assignments will be accepted. If you miss an assignment or the midterm exam, a score of 0 will be assigned unless you fill out the Student Self-Declaration of Absence (SDA) form online in Brightspace (an SDA form can be used at most twice in the course). For a missed midterm, you must contact the instructor at Nicholas.layden@dal.ca on the scheduled date of the midterm, along with your schedule so that a make-up midterm can be scheduled. All students who miss the midterm must write the make-up midterm. The SDA form <u>cannot</u> be used for missing the final examination.

Course Policies related to Academic Integrity

Students are encouraged to discuss assignments and course topics together. Assignments are to be completed independently. Group assignments are not allowed. These policies are subject to the schools standard policies on copying and plagiarism.

Learning Objectives

Students will have developed skills on formulating linear programming problems from word problems, applying linear programming techniques to various problems, and interpreting and analyzing the results of the mathematical models.

Course Content

1) Review of Linear Algebra Background
2) Introduction to Linear Programming
    a) What is a Linear Programming (LP) Problem?
    b) Graphical Solution to a Two-Variable LP Problem
    c) Variety of Real-Life Applications and LP Formulations
3) The Simplex Algorithm
    a) Converting an LP to Standard Form
    b) A Preview of the Simplex Algorithm
    c) Direction of Unboundedness
    d) The Simplex Algorithm
    e) Solving Minimization Problems
    f) Alternative Optimal Solutions
    g) Software Packages and LP Problems
    h) The Big M Method
    i) The Two-Phase Simplex Method
    j) Unrestricted-in-Sign Variables
    k) Karmarkar's Method

4) Sensitivity Analysis and Duality
    a) Graphical Introduction to Sensitivity Analysis
    b) Sensitivity Analysis
    c) The Dual of an LP problem
    d) The Dual Theorem and its Consequences
    e) Shadow Prices
    f) Duality and Sensitivity Analysis

University Policies and Statements

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 at 1321 Edward St or elders@dal.ca. Additional information regarding the Indigenous Student Centre can be found at: https://www.dal.ca/campus_life/communities/indigenous.html

Internationalization

At Dalhousie, 'thinking and acting globally' enhances the quality and impact of education, supporting learning that is "interdisciplinary, cross-cultural, global in reach, and orientated toward solving problems that extend across national borders." Additional internationalization information can be found at: https://www.dal.ca/about-dal/internationalization.html

Academic Integrity

At Dalhousie University, we are guided in all our work by the values of academic integrity: honesty, trust, fairness, responsibility, and respect. As a student, you are required to demonstrate these values in all 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. Additional academic integrity information can be found at: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student accessibility and accommodation. If there are aspects of the design, instruction, and/or experiences within this course (online or in-person) that result in barriers to your inclusion, please contact the Student Accessibility Centre (https://www.dal.ca/campus_life/academic-support/accessibility.html) for all courses offered by Dalhousie with the exception of Truro. For courses offered by the Faculty of Agriculture, please contact the Student Success Centre in Truro (https://www.dal.ca/about-dal/agricultural-campus/student-success-centre.html)

Conduct in the Classroom – Culture of Respect

Substantial and constructive dialogue on challenging issues is an important part of academic inquiry and exchange. It requires willingness to listen and tolerance of opposing points of view. Consideration of individual differences and alternative viewpoints is required of all class members, towards each other, towards instructors, and towards guest speakers. While expressions of differing perspectives are welcome and encouraged, the words and language used should remain within acceptable bounds of civility and respect.

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 (Strategic Priority 5.2). Additional diversity and inclusion information can be found at: http://www.dal.ca/cultureofrespect.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. The full Code of Student Conduct can be found at: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Fair Dealing Policy

The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie. Additional information regarding the Fair Dealing Policy can be found at: https://www.dal.ca/dept/university_secretariat/policies/academic/fair-dealing-policy-.html

Originality Checking Software

The course instructor may use Dalhousie's approved originality checking software and Google to check the originality of any work submitted for credit, in accordance with the Student Submission of Assignments and Use of Originality Checking Software Policy. Students are free, without penalty of grade, to choose an alternative method of attesting to the authenticity of their work and must inform the instructor no later than the last day to add/drop classes of their intent to choose an alternate method. Additional information regarding Originality Checking Software can be found at: https://www.dal.ca/dept/university_secretariat/policies/academic/student-submission-of-assignments-and-use-of-originality-checking-software-policy-.html

Student Use of Course Materials

Course materials are designed for use as part of this course at Dalhousie University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as books, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this course material for distribution (e.g. uploading to a commercial third-party website) may lead to a violation of Copyright law.