

# Math 340:101 Introduction to Linear Programming.

Mon Wed Fri | 2:00 p.m. - 3:00 p.m. | BUCH-Floor 1-Room A104

## Description

Linear programming problems, dual problems, the simplex algorithm, solution of primal and dual problems, sensitivity analysis. Additional topics are chosen from: Karmarkar's algorithm, non-linear programming, game theory, and applications. [3-0-0] Prerequisite: One of MATH 152, MATH 221, MATH 223.

**Instructor:** Jozsef Solymosi (office MATH 220)

For course-related emails, use Canvas mail.

**Course book:** Jirí Matoušek and Bernd Gärtner, *Understanding and Using Linear Programming*. UBC Library [link](#).

Recommended: Linear Programming, Foundations and Extensions by [Robert J. Vanderbei](#).

**Course Outline** (subject to change):

- Intro. 1 week.
- Simplex Method and related geometry. 3 - 4 weeks.
- Duality Theory. 2 -3 weeks.
- Revised Simplex Method. 1 - 2 weeks.
- Sensitivity Analysis. 1- 2 weeks.
- Interior Point Methods. 1 week.
- Further topics are Matrix games and Geometry of convex sets. 1-3 weeks.

**Learning Goals** include the following:

- To be able to translate practical (high dimensional) optimization problems into linear programming
- To understand (and to be able to visualize) the basic geometry of convex sets and its relation to linear programming
- To be able to compute solutions of linear programming by the simplex method and its variants
- To be able to manipulate matrix calculations to solve linear optimization problems
- To understand and utilize duality to solve linear optimization problems
- To give mathematical proofs for simple mathematical statements about concepts covered throughout the course, including but not restricted to convex sets, optimization, simplex method, duality, etc.

**Student resources:**

The [Math Learning Centre](#) (MLC) is in LSK 301 and LSK 302. It is open to all undergraduate students who need help in their math courses, focusing on first—and second-year courses.

**AI tools:**

Students are permitted to use artificial intelligence tools, including generative AI, to gather information, review concepts or help produce assignments. However, students are ultimately accountable for the work they submit, and any content generated or supported by an artificial intelligence tool must be cited appropriately. AI tools are not permitted during midterm and final exams in this course (No phones or advanced calculators are allowed).

**Exams:**

There will be one midterm exam and a quiz during the term.

Exam: Oct 25, in class

Quiz: Nov 18, in class

For missing exams, check the Academic Concessions part below.

**Calculators in exams:**

You can write an excellent exam without a calculator. On the other hand, if numerical calculations are not your strength, a simple non-scientific calculator might help. But the rules are strict: you can use only an **8-digit** calculator capable of basic operations. It is not allowed if your LCD can show more than eight digits. Such calculators are available for under \$10. If you are unsure if your calculator is allowed, please ask me. Allowed calculators will be marked with a sticker.

**Grading:**

Assignments: 10%

Midterm: 25%

Quiz: 15%

Final Exam: 50%

**Software:**

There are various software available to solve LP problems. We will discuss the options in class.

**Office hours:**

Wednesdays 3:00-4:30 MATH building, office 220.

**Canvas:**

Every course-related information will be posted on Canvas. You should submit your HW-s via Canvas, following the instructions.

**Piazza:**

In this course, you will use Piazza, a tool to help facilitate discussions. You will be asked to provide personally identifying information when creating an account in the tool. Please know that you are not required to consent to sharing this personal information with the tool if you are uncomfortable doing so. If you choose not to consent, you may [use a student.ubc.ca email address](mailto:use a student.ubc.ca email address) to create an account or ask about other alternatives.

## General syllabus information

### Academic concessions

For in-term concessions, fill out and submit the form [here](#) to your instructor. Academic concessions are handled through your Faculty Advising Office for final exams and other assessments submitted during the final exam period. UBC's policies on concessions can be found [here](#).

### Academic integrity

Students are expected to familiarize themselves with the University's [definition of academic misconduct](#). All cases of suspected academic misconduct will be pursued to the fullest extent. Consequences of academic misconduct may include a grade of zero on an assessment, a failing grade in a course, and suspension or expulsion from the University.

### Access and diversity

Students requiring support due to physical or learning disabilities may apply for accommodations through the [Centre for Accessibility](#) (CfA). Students must [register with the CfA](#) before requesting accommodation.

### REGISTRATION

For registration issues, refer to [this page](#). Do not contact instructors with registration issues.

### Standing deferred (SD)

You apply for [Standing Deferred](#) status through your Faculty Advising Office. The Mathematics Department expects students granted SD status to write the exam to complete the course at the next regularly scheduled exam sitting. For courses offered no more frequently than once per year, an SD exam will be set during Enrolment Services' SD summer exam period. The Mathematics Department does not take part in Enrolment Services' SD November exam period.

### UBC resources to support student success

Multiple University-wide policies and resources to support student success can be found [here](#).

### UBC Statement on Respectful Environment

The University expects courses to be respectful environments. This expectation extends to discussion forums associated with the course, where posts must be respectful and civil. The University's [Statement on Respectful Environment](#) highlights two central principles, *freedom of expression* and *promotion of free inquiry*, and an underlying requirement of *a vigorous commitment to recognition of and respect for the freedoms of others, and concern for the well-being of every member of the university community*.