

## Overview for MATH 441

(Mathematical Modeling: Discrete Optimization Problems)

Winter 2018-19, Term 1

Instructor: Prof. Joel Friedman  
Math Building, room 210  
jf@math.ubc.ca

Class: MWF 2:00–2:50pm  
Location: 102  
Office Hours: TBA or appointment

**Overview:** This course focuses on a research project that is an application of linear programming (from Math 340) or some related optimization problems (integer programming, non-linear programming, convex programming, and quadratic programming); there will also be some new material regarding applications of linear programming and related optimization problems (beyond what you have seen in Math 340). For B.A. students, this course counts as a “research intensive approved course.”

**Research Projects:** Research projects can be done in groups of 3–4 students; depending on enrolment and demand, it may be possible to have smaller groups.

Projects must

- (1) use a model(s) involving linear programming, integer programming, convex programming, quadratic programming;
- (2) involve original software written only by the group members;
- (3) test the software with “toy data” (simple data with predictable solutions) as a correctness check;
- (4) compute at least 5 variants of a similar optimization problem and compare the results (some projects may have many more than 5);
- (5) be written in  $\text{\LaTeX}$  ([overleaf.com](http://overleaf.com) is one easy way to write group projects in  $\text{\LaTeX}$ );
- (6) indicate what each group member contributed to the project.

**Homework:** Late homework will not be accepted. Your two lowest scores will be dropped in the overall homework computation.

**Prerequisite:** Math 340 is a prerequisite for this course.

**Grading and Project Deadlines:** Your grade will be based on:

**Research proposal, 5%, due September 28:** who is in your group, what are you modelling, what data will you use, list three questions you want to investigate; motivate and clearly write this up in a formal report.

**Progress report: 10%, due October 22:** you should have a formal writeup of (1) your introductory section (non-technical), (2) precise framework of your problem, (3) explain where your data comes from, (4) partial results, (5) any obstacles you have encountered, (6) your plan for the rest of the project, (7) what is each student’s individual responsibilities. You should have partial results to present to the class.

**Presentations to the class: 5%, during November:** each member of your group must present some material. Presentations will be based on the progress report; time permitting, some groups may be able to give a short, earlier presentation based on the proposal.

**Final written project: 65%, due November 21:** See above and course webpage for more details.

**Homework on new material: 15%:** See course webpage.

As in previous years, the grading and grade distribution will be reminiscent of an Arts course; historically the average has been in the low 70's, and top marks are only given for projects with clear and interesting writeups of difficult research. Historically projects usually obtain good results, but only occasionally have a stellar writeup.

**Midterm and Final:** There are no exams in this course.