

CO602/CM740/CS795: Fundamentals of Optimization
Course Outline for Fall 2020
Instructor: S. Vavasis

1 Format

The course will be delivered via pre-recorded lectures posted on-line with interactive remote office hours. Office hours are not recorded. There is also an on-campus 1-hour-per-week office-hour/tutorial session (optional) Tuesdays 12:30–1:20 in DC1350. This session will not be recorded.

2 Textbook

Bazaraa, Jarvis, and Sherali, *Linear Programming and Network Flows*, 4th ed., 2010, supplemented by notes from the instructor.

3 Course requirements

- Seven problem sets. The first six are each worth 15% of the final mark, with the lowest dropped (so a total of 75%). The last is worth 25% of the final mark.
- Two one-on-one oral exams per student. Each oral exam will go over one of the problem sets. Students will have an opportunity to partially earn back lost marks by correcting problem set mistakes during the exam.
- Students who fail both oral exams will be required to write a 2.5-hour final exam remotely with video proctoring, which will count for 40% of the mark. For this group of students, Problem Sets 1–6 are each worth 9% of the final mark, while Problem Set 7 is worth 15% of the final mark.

4 Topics covered

1. Linear programming and Simplex method
2. Weak and strong duality.
3. Total unimodularity
4. Network simplex and flow problems
5. Shortest path
6. Minimum spanning tree

7. Assignment problem
8. Nonlinear optimization
9. Gradient descent
10. KKT conditions

5 Prerequisites

Prior courses on linear algebra, multivariate calculus, and introductory real analysis. Knowledge of programming.

6 Homework contents

Homeworks will consist of analytic questions including proofs plus some Matlab programming. Knowledge of Matlab is not a prerequisite; the instructor will present modules on Matlab programming.