1 General Information

- **Instructor:** Professor Anthony Man–Cho So
  - **Office:** Online until further notice
  - **Office Hours:** By appointment
  - **Email:** manchoso@se.cuhk.edu.hk

- **Teaching Assistants:**

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- **Class Time & Location:**
  - Mondays 4:30pm — 6:15pm, online via ZOOM
  - Wednesdays 3:30pm — 5:15pm, online via ZOOM

- **Class Website:** [http://www.se.cuhk.edu.hk/~manchoso/2021/engg5501](http://www.se.cuhk.edu.hk/~manchoso/2021/engg5501)

- **Online Q&A Forum:** [http://piazza.com/cuhk.edu.hk/fall2020/engg5501](http://piazza.com/cuhk.edu.hk/fall2020/engg5501)

2 Course Objectives

In this course we will develop the basic machinery for formulating and analyzing various optimization problems. Topics include convex analysis, linear and conic linear programming, nonlinear programming, optimality conditions, Lagrangian duality theory, and basics of optimization algorithms. Applications from different fields, such as combinatorial optimization, communications, computational economics and finance, machine learning, and signal and image processing, will be used to complement the theoretical developments. No prior optimization background is required for this class. However, students should have workable knowledge in multivariable calculus, real analysis, linear algebra and matrix theory.
3 Course Outline

Part I: Introduction
- Problem Formulation
- Classes of Optimization Problems

Part II: Theory
- Elements of Convex Analysis
- Conic Linear Programming and Nonlinear Programming — Optimality Conditions and Duality Theory

Part III: Algorithms
- First–Order Methods for Unconstrained and Constrained Optimization

Part IV: Selected Applications
- Combinatorial Optimization
- Communications
- Computational Economics and Finance
- Machine Learning
- Signal and Image Processing

4 Grading

- **Homework (35%)**: There will be about 5 homeworks during the term. Typically, they are due two weeks after being assigned. You may take up to two late days during the term. However, once you have used up the late days, no more late homeworks will be accepted unless prior arrangement has been made with the instructor.

  You are allowed, and even encouraged, to discuss the homeworks with your classmates. However, you must write up the solutions on your own. Plagiarism and other anti–scholarly behavior will be dealt with severely. In particular, you should never copy from previous years’ homework solutions. Further information on academic honesty can be found at
  

- **Midterm Examination (30%)**: There will be a take–home midterm examination, tentatively scheduled in the eighth week of the course.

- **Final Examination (35%)**: There will be a take–home final examination. The details will be announced later.

5 Reference Material

There is no required textbook for this class. Lecture notes will be posted on the course website. Below is a list of material for further reading:


