

Course Outline
Optimization Theory (MATH4230)

2017/2018, Second Term: 8 January 2018 (Mon) 21 April 2018 (Sat)

No Teaching Days:

Feb. 15-21 (Thu-Wed, Lunar New Year Vacation), Apr. 2 (Mon, Easter).

Course Homepage:

<http://www.math.cuhk.edu.hk/course/1718/math4230>

Lectures:

Mon 1:30pm - 2:15pm, LSB LT4

Tue 8:30am - 10:15am, LST LT3

Tutorial:

Mon 12:30pm - 1:15pm, LSB LT4

Teacher:

Professor Tiejong Zeng

Tutors:

Wang Chao, cwang@math.cuhk.edu.hk

Wang Xia (1/2 load), xwang@math.cuhk.edu.hk

Course Description:

Unconstrained and equality optimization models, constrained problems, optimality conditions for constrained extrema, convex sets and functions, duality in nonlinear convex programming, descent methods, conjugate direction methods and quasi-Newton methods. Students taking this course are expected to have knowledge in advanced calculus.

Subject Content in Outline:

1. Introduction
2. Convex sets
3. Convex functions
4. Convex optimization problems
5. Duality
6. Unconstrained minimization
7. Equality constrained minimization
8. Advanced topics

Course prerequisite:

Most fundamental: advanced calculus and linear algebra.

The course is focused on both optimization methods and theoretical analysis. The students should be very solid in mathematical analysis, and have a very good feeling and understanding of numerical methods and rigorous mathematical reasoning. It is advised to take at Year 3 or 4.

Grade policies:

Tutorial attendance & good efforts or top 15% in both the mid- and final exams:

10%;

(tutorial assignments are counted only if they are submitted before 6:30pm right after the tutorial class)

Mid-Exam: **20%;** Final Exam: **70%.**

Mid-exam date:

Attention: Venue may be different from the currently used classroom.

Textbooks: mainly based on

1. **S. Boyd and L. Vandenberghe**, *Convex Optimization*, Cambridge University Press, 2004.
2. **D. Bertsekas, A. Nedic, A. Ozdaglar**, *Convex Analysis and Optimization* Athena Scientific, 2003.
3. **D. Bertsekas**, *Convex Optimization Theory*, Athena Scientific, 2009.

References:

1. **A. Ben-Tal and A. Nemirovski**, *Lectures on Modern Convex Optimization* (SIAM).
2. **J. M. Borwein and A. S. Lewis**, *Convex Analysis and Nonlinear Optimization* (Springer).
3. **J.B. Hiriart-Urruty and C. Lemarechal**, *Convex Analysis and Minimization Algorithms* (Springer).
4. **D. Luenberger and Y. Ye**, *Linear and Nonlinear Programming* (Springer).
5. **Y. Nesterov**, *Introductory Lectures on Convex Optimization: A Basic Course* (Kluwer).
6. **J. Nocedal and S. Wright**, *Numerical Optimization* (Springer).

Academic Honesty:

<http://www.cuhk.edu.hk/policy/academichonesty/>