

MAS583 Topics in Mathematics (Combinatorial Optimization)
2016 Spring, KAIST

We will discuss various topics in combinatorial optimization. The main focus is the mathematical ideas useful for models and algorithms. Topics include linear and integer programming, matroids and matroid optimization, shortest paths, matchings, and network flows. It will be helpful to take MAS477 (Introduction to Graph Theory) or MAS374 (Optimization Theory) before taking this course.

Lecture TTh 9AM-10:15AM Classroom: E6-1, Room 2411

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Course website <http://klms.kaist.ac.kr/>

Textbook Jon Lee, *A First Course in Combinatorial Optimizaion*, Cambridge University Press.
<http://dx.doi.org/10.1017/CB09780511616655> (Available at KAIST bookstore.)

An excellent reference for this course is: A. Schrijver, *Combinatorial Optimization: Polyhedra and Efficiency*. New York, NY: Springer-Verlag, 2003. ISBN: 3540443894.

Grading 40% Homework, 30% Midterm Exam (Take Home), 30% Final Exam (Take Home)

The lowest score and the second lowest scores from assignments will be dropped. You will earn *A* if (but not only if) your score is at least 80, *B* if your score is at least 70, *C* if your score is at least 60.

Homework Homework will be given weekly or biweekly on Thursday. The assignment is due at the beginning of class on the following Thursday. You may collaborate with other students. But **homework should be written by yourself independently and you must understand your solution.**

Homework may contain some programming projects using AMPL or other suitable languages.

Tentative schedule: (subject to change.)

- March 3: Introduction
- March 8: LP Duality (0.1–0.3)
- March 10–15: Totally unimodular matrices and bipartite matching (0.8)
- March 17– April 7: Matroids (Chapter 1), Matroid Intersection (Chapter 3)
- April 12–14: Shortest paths (Chapter 2), Flows and Cuts (Chapter 5)
- April 28, 4:15PM: Attend the Colloquium lecture by Prof. András Sëbo, *crossing roads in combinatorial optimization: the salesman, the postman, and polyhedra*.
- April 28–May 12: **Special guest lecture by Prof. András Sëbo, G-SCOP, France**
Further topics on matroids, Non-bipartite matchings of graphs, Chinese postman, T-join polyhedra.
- May 17–June 9: Further topics ideal hypergraphs, Lehman's theorem, Mengerian hypergraphs, Lucchesi-Younger theorem.