

IE 631 Integer Programming

Fall, 2018

Instructor: Prof. Sungsoo Park (sspark@kaist.ac.kr), Building E2-2, room 4112, Tel: 3121

Office hours: Mon., Wed., 14:30 – 16:30 or by appointment

TA: to be announced

Class hour: Mon., Wed., 13:00 – 14:30

Classroom: IE building (E2-2) #1120

Homepage: <https://solab.kaist.ac.kr/> (to be opened)

Text: "Integer and Combinatorial Optimization" by G. Nemhauser and L. Wolsey, 1988, Wiley.

Supplementary sources :

"Integer Programming" by L. Wolsey, 1998, Wiley

"Computers and Intractability: A Guide to the Theory of NP-completeness" by M. Garey and D. Johnson, 1979, Freeman

"Optimization over Integers" by D. Bertsimas and R. Weismantel, 2005, Dynamic Ideas

"Integer Programming" by M. Conforti, G. Cornuejols, and G. Zambelli, 2014, Springer **Class**

Handouts

Grading: Midterm 30 - 40%, Final 40 - 60%, Homework 10 - 20%

Summary of lecture:

We consider the theories and applications of integer optimization problems, in which all or part of the decision variables in the model are required to take on integer values.

Many decision problems arising in production, scheduling, logistics, telecommunication, networks, graphs, etc., can be modeled as integer programs. We consider algorithms to solve the problems and underlying properties and theories of the integer program itself. Strong backgrounds in linear programming is required (IE531 Linear Programming or equivalent, see the instructor if you do not have enough background.). The following is the list of topics we will study and rough schedule.

- Introduction, formulations (1 week)
- Strong formulations (1 week)
- Polyhedral theory and integer programs (2 weeks)
- Computational complexity (3 weeks)
- Midterm examination (1 week)
- Branch-and-bound algorithm (1 week)
- Strong valid inequalities, cutting plane algorithms (2 weeks)
- Duality and relaxation, Lagrangian duality, Benders' decomposition (2 weeks)
- Branch-and-price algorithm, Branch-and-price-and-cut algorithm (1 week)
- Robust optimization (1 week)
- Final examination (1 week)

The class language is English. However, we may switch to Korean if no foreign student is registered.