IE 331 Operations Research 1-Optimization

Spring, 2018

Instructor: Sungsoo Park (sspark@kaist.ac.kr), Building E2-2, room 4112, Tel: 3121
Office hour: Mon, Wed 14:30 – 16:30 or by appointment

TA: To be announced

Class hour: Tue, Thr 14:30 – 16:00

Class room: IE building (E2-2) 1501

Homepage: http://solab.kaist.ac.kr/

Text: "Linear Programming", Vasek Chvatal, Freeman, 1983 and class handouts

Grading: Midterm 30 - 40%, Final 40 - 50%, Homework 10 - 20% (Including computer assignments)

Contents:

This course introduces the concepts and applications of Operations Research. We will mainly deal with deterministic models. Stochastic(Probabilistic) models will be treated in OR-II. OR is mainly concerned with using mathematical models to solve the problems arising in operation, design and evaluation of economic and/or social systems. We will cover basic deterministic models and their algorithms. Knowledge of linear algebra is required as prerequisite. In addition, mathematical maturity, i.e. reading and understanding mathematical proofs, is necessary.

Unlike an ordinary introductory course on OR, we will try to give more in-depth coverage on linear programming(LP) since we do not have a course on LP in undergraduate. LP has a well built structure of theory and new ideas will be developed onto the previous results. Theory of LP will also be used later in class for other parts. Hence, if you do not follow up the course, you may get into trouble later in understanding the developments. Last minute cram will not help you much. The language used in the lecture is English.

The following is the tentative list of topics we will cover.

- Introduction to OR. Backgrounds (1 week)
- Review of linear algebra, system of linear equations (1 week)

- Formulations (linear, integer) (1 week)
- Simplex method, efficiency of simplex method, geometry of LP (3 weeks)
- Pitfalls, cycling, two phase method (1 week)
- Midterm examination (1 week)
- Duality theory (1 week)
- Revised simplex method, general LP problems (LP with bounded variables) (2 weeks)
- Sensitivity analysis, infeasible systems (1 week)
- Integer Programming; models, branch-and-bound algorithm, cutting planes (1 week)
- Network models; terminology, minimum spanning tree problem, shortest path problem, maximum flow problem, min cost flow problem (1 week)
- Dynamic programming (1 week)
- Final examination (1 week)