IE 331 Operations Research: Optimization
Spring 2025

1 Course Contact

○ Class Meetings: Tuesdays and Thursdays 10:30–12:00, E2 산업경영학동 1501
○ Instructor: Professor Changhyun Kwon (권창현)
  – chkwon@kaist.ac.kr
  – https://www.chkwon.net
  – Office Hours: TBA
○ Teaching Assistant: TBA
  – Office Hours: TBA
○ Online Course Content:
  – KLMS

2 Course Description

This course intends to cover basic materials in the areas of operations research that prove to be most effective in real-world applications. Topics include Linear Programming, Integer Programming, Nonlinear Programming, Transportation, Network Model, and Dynamic Programming. Special emphasis is placed on solving the problems drawn from real-world situations and computational tools. By the end of this course, students will be able to derive a mathematical model for various decision-making problems and suggest a proper computational optimization method and a software tool.

3 Prerequisites

A course in linear algebra

4 Textbook and References

○ Main Textbook: Introduction to Operations Research, Hillier and Lieberman, 10th or 11th ed. https://product.kyobobook.co.kr/detail/S000003153091
○ References:
  – Julia Programming for Operations Research, Kwon, 2nd ed., 2019, https://www.chkwon.net/julia/
  – Algorithms for Optimization, Kochenderfer and Wheeler, MIT Press, 2019, https://algorithmsbook.com
  – Applied Mathematical Programming, Bradley, Hax, and Magnanti, Addison-Wesley, 1977, https://web.mit.edu/15.053/www/AMP.htm

5 Topics Covered

○ Introduction to Operations Research
○ Linear Programming
○ Simplex Method
○ Duality

○ Network Models
○ Integer Programming
○ Branch-and-Bound
○ Branch-and-Cut
○ Nonlinear Programming
○ Karush-Kuhn-Tucker Conditions
○ Unconstrained Optimization Algorithms
○ Dynamic Programming
○ Meta-heuristics
○ Game Theory
○ Open-Source Software Tools: JuMP.jl (Julia), PuLP (Python), OR-Tools, GLPK, HiGHS
○ Commercial Software Tools: Gurobi, CPLEX

6 GRADING

○ 20% Homework Assignments
○ 25% Quizzes
○ 25% Mid-term Exam
○ 25% Final Exam
○ 5% Class Participation