The Hong Kong University of Science & Technology

Department of Industrial Engineering & Decision Analytics

Course Title: Prescriptive Analytics
Course Code: IEDA 3010
No. of Credits: 3 credits
Co-requisites: MATH 2111
Semester: Fall 2024

Instructor

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Consultation hours: Tuesday 13:00-14:00 (by appointment)

Teaching Assistants

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Class Schedule

Lecture: Tuesday (10:30-12:50),
Tutorial: Wednesday (18:00-19:20); Thursday (13:30-14:50)

Objectives

1. To introduce the fundamental and long-lasting ideas in prescriptive analytics and operations research;
2. To learn how to frame the real-life constrained decision-making problems with data;
3. To generate complex decisions using basic mathematical models, intelligence algorithms and software;
4. To prepare and motivate future research on advanced level.

Key Learning Outcomes

1. Students are able to identify real-world objectives and constraints based on the descriptions of actual decision-making problems
2. Students are able to create mathematical optimization models
3. Students are able to work through solution techniques
4. Students are able to derive solutions using software
5. Students are able to make recommendations based on solutions, analysis, and limitations of models

Course Assessment

Homework Assignments (3)	15%
Midterm Exam	30%
Final Exam	40%

Project	15%

1. **Midterm Exam (2hrs)**: covers materials taught in the first half of the semester. Only one A4-size, double-sided and hand-written aid sheet is allowed.
2. **Final exam (2hrs 30 mins)**: covers all materials. Only two A4-size, double-sided and hand-written aid sheets are allowed.
3. **Project**: The main goal of the project is to help us understand how data analysis, model buildings and solution tools are used in an integrative way in real practice. Ideally, each team project consists of 4 to 5 members. We can identify the real problem, collect and analyze data, build optimization models, derive optimal solutions with algorithms and software, and finally make recommendations. The timeline, detailed requirements and some sample topics will be announced later.

Course Materials

Notes and reading materials are available for download from Canvas course site.

Optional References

1. *Introduction to Operations Research* (9th edition). F.S. Hillier & G.J. Lieberman. 2015
2. *Data, Models, and Decisions. The Fundamentals of Management Science.* D. Bertsimas & R.M. Freund. 2004
3. *Learning Python: Powerful Object-Oriented Programming* (5th edition). M. Lutz. 2013

List of Topics (tentative)

1. Linear optimization
2. Network models
3. Discrete optimization
4. Dynamic programming
5. Nonlinear optimization
6. Decision analysis
7. Coding language: Python