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 2025

Teaching Team

Instructor

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Teaching Assistants

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Class Schedule

Lecture: Friday (13:30-15:50), Room 5583
Tutorial: Wednesday (12:00-13:20 & 15:00-16:20), Room 3207

Course Description

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.

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

Intended Learning Outcomes (ILOs)

By the end of this course, students should be able to:

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

Assessment and Grading

This course will be assessed using criterion-referencing and grades will not be assigned using a curve. Detailed rubrics for each assignment are provided below, outlining the criteria used for evaluation.

Assessment Task	Contribution to Overall Course Grade (%)	Due Date
Homework Assignments (3)	15%	Week 4, Week 9, Week 13
Midterm Exam	30%	Week 8
Final Exam	40%	Exam Week
Group Project	15%	Week 13

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.

In the project, you are expected to perform the following:

- Formulate problem/issue: Summarize the reference. Give a brief introduction of your problem, the objective you want to achieve and the reasons why you want to solve.
- Model setup: Formulate your problem, which should include variables and constraints interpretation, along with an optimization model.
- Realization: With the python or excel solvers, solve the problem and derive correct solutions.
- Analysis: Based on your model, give suggestions and draw conclusions on the problem in hand.

Mapping of Course ILOs to Assessment Tasks

Assessed Task	Mapped ILOs	Explanation
Homework Assignments (3)	ILO1, ILO2, ILO3, ILO4	Homework are designed to assess students' foundational understanding of the actual decision-making problem (ILO1) and their ability to create the mathematical models (ILO2). Furthermore, the skills to derive solutions with software (ILO3, ILO4) are also evaluated.
Midterm Exam	ILO1, ILO2, ILO3	Midterm exam evaluates students' ability to formulate decision-making problems (ILO1) with linear optimization models (ILO2), and solve them with various algorithms (ILO3).
Final Exam	ILO1, ILO2, ILO3, ILO5	Final exam assesses students' ability to understand and formulate the real problem (ILO1, ILO2), derive solutions both manually and through software (ILO3), and synthesize a well-argued solution (ILO5).
Group Project	ILO1, ILO2, ILO3, ILO4, ILO5	Group project allows students to work in group and put into practice what they have learned to tailor-made project (ILO1), including create mathematical models (ILO2), derive solutions (ILO3, ILO4), and make recommendations (ILO5).

Final Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	• Mastery of prescriptive analytics concepts like linear optimization, discrete optimization, etc. • Applies advanced problem-solving techniques creatively to complex real-world scenarios. • Actively contributes to class discussions and collaborates effectively on group projects. • Explores additional topics, such as advanced optimization methods. • Produces high-quality work that reflects thorough analysis and insight.
B	Good Performance	• Shows a solid understanding of core prescriptive analytics principles and methods. • Effectively applies problem-solving techniques to moderately complex problems. • Participates actively in discussions and collaborates well with peers. • Completes assignments with a good level of detail and accuracy. • Demonstrates some initiative in exploring additional topics related to the course.
C	Satisfactory Performance	• Exhibits a basic understanding of prescriptive analytics concepts and techniques. • Can solve standard problems but may struggle with more complex scenarios. • Participates in class but may not always engage deeply in discussions. • Completes assignments to meet minimum requirements. • Shows limited exploration of topics beyond the core curriculum.
D	Marginal Pass	• Displays a minimal understanding of key prescriptive analytics concepts. • Struggles to apply problem-solving skills effectively, often providing incomplete or incorrect solutions. • Participation in class is infrequent, and collaboration with peers is limited. • Assignments are often incomplete or lack coherence and clarity. • Shows little initiative to engage with the material or explore additional topics.
F	Fail	• Fails to demonstrate an understanding of prescriptive analytic principles. • Struggles significantly with problem-solving tasks and does not meet basic assignment requirements. • Minimal to no participation in class discussions or group work. • Submits assignments that are incomplete, poorly constructed, or missing altogether. • Shows no effort to engage with the course material or improve understanding.

Course AI Policy

There are no restrictions on use of generative AI for an assessment task in this course.

Communication and Feedback

Announcements will be made regularly via Canvas and / or via email. Please pay attention to those announcements/emails and reply when necessary.

Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Students who have further questions about the feedback including marks should consult the instructor within five working days after the feedback is received.

Academic Integrity

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST's Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct. Please refer to Academic Integrity | HKUST – Academic Registry for the University's definition of plagiarism and ways to avoid cheating and plagiarism.