IEDA 1250 – Optimizing Decisions for Personal and Business Development

School:	**School of Engineering**
Subject Area:	**Industrial Engineering and Decision Analytics**
Course Credit:	**3**
Instructor:	**YANG Bo**
Pre-requisite/co-requisite:	**Nil**

Notes:

- The syllabi provided here is for reference only and may be subject to changes and adjustments as determined by the course instructors.

The Hong Kong University of Science and Technology

Optimization for Decision Making (IEDA 1250)

Summer, 2026

Class Schedule: Monday, Wednesday, Friday 09:00 am - 12:20 pm

Classroom: TBD

Instructor: Prof. Bo YANG (yangb@ust.hk)

Office hour: Office 5584, Monday 2:00 pm - 3:00 pm

Teaching assistants: TBD

Tutorial: TBD

Course Description

Optimization plays a central role in enhancing decision making - be it in traditional engineering and business settings or in today's more competitive and dynamic world powered by advanced AI techniques. Effective decision making requires sophisticated modeling and solution skills to improve performance metrics such as profit, accuracy, speed, etc. This course provides students with a glimpse of fundamental optimization techniques and their applications in areas such as inventory control, vehicle routing, financial trading, and machine learning, while preparing students for more advanced coursework in optimization and analytics.

Recommended Textbooks

The textbooks are optional but recommended for students with particular interests in optimization. They contain broader and deeper contents than those covered in class. In particular, the third textbook is theoretical and has rigorous mathematical proofs for many optimization algorithms (i.e., explanations on "why" the optimization algorithms work).

- *Introduction to Operations Research*, by Hillier, Frederick S., and Gerald J. Lieberman, McGraw-Hill, 2015.
- *Operations and Supply Chain Management*, by F. R. Jacobs and R. Chase (13th edition), McGraw-Hill, 2018
- *Convex Optimization*, by Boyd, Stephen, 2004

This course will loosely follow the first textbook. There is no need for students to go

through all materials to obtain descent scores.

Prerequisites

No prerequisite is required, as the course serves as an introduction to optimization.

Course Web Page

A web page will be available for this course on Canvas. You will need to access this web page for announcements about class, lecture notes, homework assignments and their solutions, and other materials. All slides will be posted on Canvas before each lecture.

Grading

Your final grade will be determined using the following weights:

1. Two Individual Assignments 20%
2. Midterm Exam 40%
3. Final Exam 40%
4. Attendance 0%

Grading is very lenient in this course. In other words, requests for regrading will **NOT** be considered unless there are obvious grading errors. If students insist on regrading, all questions will be regraded for fairness.

Assignments

There will be two homework assignments. Students are expected to work individually on them. A soft copy of the homework should be uploaded via Canvas on or before the due date. There will be a week for students to finish the homework. Late submissions will **NOT** be accepted, as the solution will be posted right after the due time.

Exams

Both the midterm and final examinations are 80 minute tests that will be held during scheduled class sessions. Further details regarding the timing and location will be provided in due course.

Class Participation

Please come to the class fully prepared. This will maximize your gain from the class. Regular attendance and participation in all classes will be helpful for the boundary case.

Policies

As a member of the HKUST community, you are expected to meet the highest standards of academic behavior. Please review the university statement on academic integrity. On homework assignments, high-level collaboration, like discussion on methods to solve homework problems, is permitted. However, sharing solutions or numerical answers is not allowed and is considered cheating. Sharing solutions or cheating on exams will result in a zero grade on that assignment or exam, and related university policies will be strictly enforced.

Tentative Topics

We will walk through the following topics. Coding skills are not required, though there are "programmings" in the topics.

1. Introduction
    - Motivating examples
2. Deterministic decision making: Introduction to linear programming
    - Motivating examples
    - Linear programming model
    - Graphical solution
    - Duality theory
    - Commercial solver: Excel & Gurobi
3. Deterministic decision making: Introduction to integer programming
    - Motivating examples
    - Integer programming model
    - Branch and bound approach
    - Modeling techniques
    - Commercial solver: Excel & Gurobi
4. Probability basics
    - Definitions such as probability, random variables, and cumulative distribution function
    - Discrete probability distributions
5. Making decisions with other players: Introduction to game theory

- Motivating examples
- Definitions
- Dominating policies
- Minimax theorem
- LP approach

6. Decision making in service oriented processes: Introduction to queueing theory

    - Motivating examples
    - Basic metrics and parameters to a queueing system
    - Little's law
    - M/M/1 queue
    - PASTA
    - M/M/k queue

7. Sequential decision making: Introduction to dynamic programming

    - Motivating examples
    - Backward induction
    - Shortest path problem
    - Recourse allocation problem
    - Production planning
    - Brief introduction to Markov decision processes

8. Decision making in Investment (Optional)

    - Brief introduction to risk neutral probability, replication, binomial tree, hedging, and valuation via real options approach