

The Hong Kong University of Science and Technology

UG Course Syllabus

Course Title: Numerical Methods for Financial Engineering

Course Code: IEDA4520

No. of Credits: 3

Any pre-/co-requisites:

- Basic knowledge in Python or R is recommended.
- (IEDA 3250 OR ISOM 2500) AND (IEDA 3330 OR FINA 3203)

Name: Prof. Xiaowei Zhang

Email: xiaoweiz@ust.hk

Course Description

This course aims to introduce important numerical methods that have been widely applied in financial engineering, with a focus on Monte Carlo simulation and machine learning. A tentative list of topics to be covered is as follows.

- Monte Carlo simulation
 - Principles of MC methods and derivatives pricing
 - Generating sample paths
 - Variance reduction techniques
 - Estimation sensitivities
 - Nested simulation for risk management
- Machine learning methods
 - Multi-factor pricing models
 - Regularized linear regression, tree-based methods, kernel methods
 - Applications in asset pricing, credit scoring, and fraud detection

Assessments:

Assessment Task	Contribution to Overall Course grade (%)
Homework Assignments (3)	30%
Midterm Exam	30%
Group Project	40%

Required Texts and Materials

- Paul Glasserman (2003). *Monte Carlo Methods in Financial Engineering*, Springer.
- Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani (2021). *An Introduction to Statistical Learning*, 2nd edition, Springer.