**City University of Hong Kong**
**Course Syllabus**

**offered by Department of Management Sciences**
**with effect from Semester A 2024/25**

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## Part I Course Overview

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| **Course Title:** | Predictive Modeling in Marketing |
| **Course Code**: | MS6221 |
| **Course Duration:** | One semester |
| **Credit Units**: | 3 |
| **Level**: | P6 |
| **Medium of Instruction:** | English |
| **Medium of Assessment:** | English |
| **Prerequisites**: *(Course Code and Title)* | MS5218 Applied Linear Statistical Models |
| **Precursors**: *(Course Code and Title)* | Nil |
| **Equivalent Courses**: *(Course Code and Title)* | MS6218 Statistical Modelling in Marketing Engineering |
| **Exclusive Courses**: *(Course Code and Title)* | Nil |

## Part II Course Details

### 1. Abstract

The goal of this class is to provide a comprehensive overview of modern data-driven marketing techniques. We will explore key areas of marketing that rely on data-driven decisions, including targeted promotions and advertisements, churn management, recommender systems, pricing, and demand prediction. The course will emphasize applied predictive modeling in Python and the use of machine learning tools in the data science industry. Prerequisites include one course in probability and statistics, and one course in regression analysis. Students should expect to dedicate at least five hours of work following each lecture.

### 2. Course Intended Learning Outcomes (CILOs)

*(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)*

| No. | CILOs | Weighting (if applicable) | Discovery-enriched curriculum related learning outcomes (please tick where appropriate) | | |
|---|---|---|---|---|---|
| | | | *A1* | *A2* | *A3* |
| 1. | Enhance proficiency in Python programming for data analysis. | 20% | ✓ | ✓ | |
| 2. | Gain experience in analyzing real marketing data using statistical and machine learning models. | 40% | | ✓ | |
| 3. | Learn how to frame marketing decision problems (such as pricing, promotion, advertising, and customer relationship management) as data analysis tasks and make informed decisions based on statistical and machine learning model results. | 40% | | ✓ | ✓ |
| | | 100% | | | |

*A1: Attitude*
*Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.*

*A2: Ability*
*Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.*

A3: *Accomplishments*
*Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.*

### 3. Learning and Teaching Activities (LTAs)

*(LTAs designed to facilitate students' achievement of the CILOs.)*

| LTA | Brief Description | CILO No. | | | | | | Hours/week (if applicable) |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | | | | |
| Classroom Lectures | Students will engage in a structured schedule of regular lectures and demonstrations designed to enhance their understanding of the course material. Through active participation and interaction, | ✓ | ✓ | ✓ | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | students will have the opportunity to deepen their knowledge and grasp the intricacies of the content presented during these sessions. | | | | | | | |
| Computer Lab Tutorials | Students will work on a variety of tasks, ranging from basic syntax exercises to more advanced coding challenges during these Python programming sessions. | ✓ | ✓ | | | | | |
| Group Assignment | Students will team up and collaborate on coding projects to tackle coding challenges collectively and enhance their problem-solving skills. | ✓ | ✓ | ✓ | | | | |

## 4. Assessment Tasks/Activities (ATs)

*(ATs are designed to assess how well the students achieve the CILOs.)*

| Assessment Tasks/Activities | CILO No. | | | | | | Weighting | Remarks |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | | | | | |
| Continuous Assessment: 100 % | | | | | | | | |
| Assignment | ✓ | ✓ | ✓ | | | | 40% | |
| In-Class Midterm | | ✓ | ✓ | | | | 30% | |
| Project | ✓ | ✓ | ✓ | | | | 30% | |
| Examination: 0 % | | | | | | | | |
| | | | | | | | 100% | |

## 5. Assessment Rubrics

*(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)*

Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter

| Assessment Task | Criterion | Excellent (A+, A, A-) | Good (B+, B, B-) | Fair (C+, C, C-) | Marginal (D) | Failure (F) |
|---|---|---|---|---|---|---|
| 1. Assignment | Answer simple questions related to concepts introduced in the class and perform data analysis using Python to solve real marketing problems. | High | Significant | Moderate | Basic | Not even reaching marginal levels |
| 2. In-Class Midterm | The midterm test is designed to assess students' understanding of models and their ability to frame marketing problems within a data analysis framework. | High | Significant | Moderate | Basic | Not even reaching marginal levels |
| 3. Project | Students are required to work with real business data, applying concepts and models learned in the class to analyze the data and make informed business decisions. Proficiency in Python programming is essential. | High | Significant | Moderate | Basic | Not even reaching marginal levels |

Applicable to students admitted from Semester A 2022/23 to Summer Term 2024

| Assessment Task | Criterion | Excellent (A+, A, A-) | Good (B+, B) | Marginal (B-, C+, C) | Failure (F) |
|---|---|---|---|---|---|
| 1. Assignment | Answer simple questions related to concepts introduced in the class and perform data analysis using Python to solve real marketing problems. | High | Significant | Moderate | Fail to understand the core concepts |
| 2. In-Class Midterm | The midterm test is designed to assess students' understanding of models and their ability to frame marketing problems within a data analysis framework. | High | Significant | Moderate | Fail to understand the core concepts |
| 3. Project | Students are required to work with real business data, applying concepts and models learned in the class to analyze the data and make informed business decisions. Proficiency in Python programming is essential. | High | Significant | Moderate | Fail to understand the core concepts |

**Part III Other Information** (more details can be provided separately in the teaching plan)

## 1. Keyword Syllabus

*(An indication of the key topics of the course.)*

1. Introduction
    - Introduction to Data-Driven Marketing
    - Introduction to Python
    - Linear Regression in Python

2. Promotions and Advertisements
    - Modern Targeting Methods using Machine Learning
    - Recency-Frequency-Monetary (RFM) Analysis
    - Customer Lifetime Value and Retention (Churn Management)
    - Predictive Modeling and Customer Acquisition
    - Measuring the Effectiveness (A/B testing)

3. Recommender Systems
    - Quantitative Metrics for Evaluation
    - Content-based Filtering
    - Collaborative Filtering

4. Pricing and Demand Prediction
    - Demand and Price Elasticity
    - Price Structure and Segmentation
    - Forecasting Demand using Machine Learning

## 2. Reading List

### 2.1 Compulsory Readings

*(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)*

Nil

### 2.2 Additional Readings

*(Additional references for students to learn to expand their knowledge about the subject.)*

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| 1. | James, Gareth, Daniela Witten, Trevor Hastie, and Robert Tibshirani. An introduction to statistical learning: with Applications in R. Springer, 2017.<br><br>This is a good book about machine learning algorithms, examples are demonstrated in R. |
| 2. | Müller, Andreas C., and Sarah Guido. Introduction to machine learning with Python: a guide for data scientists. " O'Reilly Media, Inc.", 2016.<br><br>This is a good book about machine learning with Python. |

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| 3. | Rossi, Peter E., Greg M. Allenby, and Rob McCulloch. Bayesian statistics and marketing. John Wiley & Sons, 2012.<br><br>This book covers some concepts of quant marketing and Bayesian statistics. |