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

Course Title: Predictive Analytics with Excel and R

Course Code: MS5318

Course Duration: One semester

Credit Units: 3

Level: P5

**Medium of
Instruction:**   English

**Medium of
Assessment:**   English

Prerequisites:
(Course Code and Title)   Nil

Precursors:
(Course Code and Title)   Nil

Equivalent Courses:
(Course Code and Title)   Nil

Exclusive Courses:
(Course Code and Title)   Nil

Part II   Course Details

1.   Abstract

This course introduces key statistical concepts and methodologies essential for making data-driven predictions. Starting with fundamental statistical analysis, such as inference and simple regression, it expands into more advanced topics like logistic regression and model selection. You will learn to build predictive models using datasets with various structures, including quantitative and categorical responses and predictors. Discover the balance between over-predicting and under-predicting, and apply these methods to real-world business problems, such as healthcare operations and fraud detection, through practical examples and case studies. Excel will be used for data manipulation and visualization, while R will be employed for processing data and generating prediction models. No prior statistical knowledge or experience with Excel and R is required, making this course accessible to beginners.

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.	Understand and apply fundamental statistical techniques, including hypothesis testing, regressions, model selection and calibration, and data visualization.	40%	✓		
2.	Utilize predictive analytics in business contexts to inform and enhance decision-making.	30%	✓	✓	
3.	Formulate and analyze real-world data problems, and effectively communicate data-driven solutions	30%	✓	✓	✓
		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		
Engaging in Lectures and In-Class Practice	Students will attend in-class lectures where the instructor introduces key concepts and modeling techniques. Students will understand how to perform statistical modeling using Excel and R. Students will practice the	✓	✓	✓		3 hours/week

	newly acquired knowledge through in-class exercises.						
Completing Assignment	Students will work on after-class exercises to deepen the understanding of basic concepts and practice modeling techniques. Peer discussions are encouraged on assignment problems. Students must complete the assignments individually to ensure personal understanding and application of the material.	✓	✓	✓			
Collaborating on Group Project	Students will form a group with other students to tackle a real-world decision-making problem using provided datasets. Students will collaborate with peers to apply statistical knowledge to this project, analyze the data, and develop solutions.	✓	✓	✓			

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: 70%								
Class Participation	✓						10%	
Assignment	✓	✓	✓				25%	
Group Project		✓	✓				15%	
Test	✓	✓					20%	
Examination: 30% (duration: 3 hours, if applicable)								
Examination	✓	✓	✓				30%	
							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. Class participation	Level of evidence of attending class on time, participating in-class discussion; no private conversations, no use of cell phones/laptops unless with the permission of the instructor	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Assignment	Level of evidence of critical capacity and analytic ability; understanding of concepts	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Group Project	Level of understanding of key concepts and abilities to develop predictive models as well as to interpret the solutions	High	Significant	Moderate	Basic	Not even reaching marginal levels
4. In-Class Test	Level of understanding of statistical concepts and predictive modelling methods	High	Significant	Moderate	Basic	Not even reaching marginal levels
5. Examination	Level of understanding of key concepts and abilities to develop predictive models as well as to interpret the solutions	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. Class participation	Level of evidence of attending class on time, participating in-class discussion; no private conversations, no use of cell phones/laptops unless with the permission of the instructor	High	Moderate	Basic	Unsatisfactory
2. Assignment	Level of evidence of critical capacity and analytic ability; understanding of concepts	High	Moderate	Basic	Unsatisfactory
3. Group Project	Level of understanding of key concepts and abilities to develop predictive models as well as to interpret the solutions	High	Moderate	Basic	Unsatisfactory
4. In-Class Test	Level of understanding of statistical concepts and predictive modelling methods	High	Moderate	Basic	Unsatisfactory
5. Examination	Level of understanding of key concepts and abilities to develop predictive models as well as to interpret the solutions	High	Moderate	Basic	Unsatisfactory

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.)

- Data Visualization
- Data manipulation with R
- Sampling
- Hypothesis testing and confidence intervals
- ANOVA
- Regressions: simple/multiple linear regression
- Variable selection
- Classification: Logistic regression, KNN

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.)

1.	An Introduction to Statistical Learning, by Robert Tibshirani and Trevor Hastie
2.	Statistics for Business: Decision Making and Analysis, Second Edition, by Robert Stine and Dean Foster.
3.	Business Statistics for Competitive Advantage with Excel 2013, Second Edition, by Cynthia Fraser.
4.	Practical Regression and Anova using R (this is an online book), By Julian J. Faraway