City University of Hong Kong
Course Syllabus

offered by Department of Management Sciences
with effect from Semester A 2022 / 23

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

The aim of this course is to introduce the statistical concepts and methodologies that are often associated with making predictions with data. We begin with fundamental statistical analysis (e.g. inference, simple regression), then adds both breadth (e.g. logistic regression) and depth (e.g. model selection) to the use of regression to find the best prediction model for business forecasting. You will learn how to build predictive models with data sets in various structures (e.g. quantitative or categorical response/predictors). You will understand the trade-off between over-predicting versus under-predicting. You will practice utilizing the learned methods to solve data-based business decision problems (e.g. healthcare operations, fraud detection) through examples and case studies. R language will be used to process data and generate prediction models. No prior statistical knowledge is required, and you do not need prior knowledge about Excel or R.

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.	To understand the basic of various statistical techniques and predictive modeling, e.g. hypothesis testing, regressions, model selection/calibration, data visualization.	40%	✓		
2.	To learn and apply tools from predictive analytics in business decision situations.	30%	✓	✓	
3.	To be able to formulate and analyze real-world problems concerning data, and communicate analytical results more effectively	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 self-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. Teaching and Learning Activities (TLAs)
(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.						Hours/week (if applicable)
		1	2	3				
Lecture	In-class lecturing and practicing: Instructor will first introduce the concepts and modelling techniques; instructor will show how to perform statistical modelling using Excel/R; students are expected to practice the new knowledge with in-class exercises.	✓	✓	✓				3 hours/week
Assignment	After-class exercises to understand basic concepts and practice modelling techniques; students are encouraged to discuss assignment problems with their peers, but are expected to finish the assignments individually.	✓	✓	✓				
Group Project	Data sets will be provided for students to tackle a real-world decision making problem from healthcare industry; students will form groups to work on the project together.	✓	✓	✓				

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 in Semester A 2022/23 and thereafter

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. 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

Applicable to students admitted before Semester A 2022/23

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. 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

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

1.   **Keyword Syllabus**

- 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