

**City University of Hong Kong
Course Syllabus**

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

Part I Course Overview

Course Title: Applied Linear Statistical Models

Course Code: MS5218

Course Duration: One semester

Credit Units: 3

Level: P5

Medium of Instruction: English

Medium of Assessment: English

Prerequisites:
(Course Code and Title) MS5217 Statistical Data Analysis

Precursors:
(Course Code and Title) Nil

Equivalent Courses:
(Course Code and Title) MS5213 Statistical Methods II

Exclusive Courses:
(Course Code and Title) Nil

Part II Course Details

1. Abstract

This course introduces the statistical concepts and methodologies underpinning linear statistical models, with a focus on their application in business analytics. Key topics include multiple regression models, regression models for both quantitative and qualitative variables, model building and variable selection, diagnostics and remedial measures, analysis of variance (ANOVA), logistic regression, time series analysis, and Bayesian linear regression. Students will learn to formulate and test hypotheses, and apply criteria such as Cp, AIC, and BIC for model comparison. The curriculum emphasizes practical skills in diagnosing model issues and implementing corrective measures. Through hands-on projects, students will develop their analytic abilities to integrate and apply quantitative methods to real-world business problems. Additionally, the course will enhance students' proficiency in presenting their analytical findings effectively, preparing them for data-driven decision-making in their professional careers.

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.	Analyze real-world business problems using linear model methods and interpret the results of their analyses.	N.A.		✓	
2.	Evaluate the use of linear model methods in solving business problems and assess their appropriateness, accuracy, and limitations.	N.A.	✓		
3.	Demonstrate competence in using popular statistical software packages to analyze business data with linear model methods.	N.A.		✓	
4.	Communicate the results in written and electronic formats, preparing presentations that adhere to common business practices.	N.A.			✓
		N.A.			

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	4	
Engage in lectures	Understand concepts and specific subject knowledge through detailed explanations and examples provided by the instructor.	✓	✓			2.0
Participate in class discussion	Explore and discuss problems and cases given in class, collaboratively develop possible solutions, and receive instant feedback and support from the instructor on queries.		✓	✓		0.5
Attend computer laboratory sessions	Gain hands-on experience with statistical software packages to analyze datasets. Formulate problems into statistical models and analyze data with the support of these packages.	✓	✓	✓		0.5
Complete a project	Analyze and explore a real-life case with provided data. Integrate techniques learned in the course to design an efficient solution for the problems presented in the case. Summarize findings in a slide deck and present them in class.	✓	✓	✓	✓	N.A.

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	4			
Continuous Assessment: 60%							
<p>Project/Assignment</p> <p>Students work together in groups to complete a project using regression methods learned in the course. The project includes:</p> <p>Designing project objectives and formulating the problem.</p> <p>Data modeling and analysis using statistical software.</p> <p>Presenting the project and findings.</p> <p>Preparing a comprehensive project report.</p>	✓	✓	✓	✓		30%	
<p>Test</p> <p>The test assesses students' professional knowledge and ability to apply linear regression techniques to solve business problems.</p>	✓	✓	✓			30%	
Examination: 40% (duration: 3 hours, if applicable)							
<p>Examination</p> <p>The final exam is designed to assess students' comprehensive knowledge and ability to apply linear regression techniques to solve business problems. It includes:</p> <p>Conceptual questions to test understanding of theories.</p> <p>Data analysis problems requiring the use of statistical software output.</p>	✓	✓	✓			40%	

Interpretative questions to evaluate the ability to draw conclusions from analyses.								
							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.Project/Assignment	Ability in using the appropriate statistical methods to solve the business problem	Strong evidence of original thinking; good organization, capacity to analyse and synthesize; superior grasp of subject matter; evidence of extensive knowledge base	Evidence of original thinking, some evidence of critical capacity and analytic ability; reasonable understanding of issues; evidence of familiarity with literature	Little evidence of original thinking, little evidence of critical capacity and analytic ability; reasonable understanding of issues	Sufficient familiarity with the subject matter to enable the student to progress without repeating the case report	Little evidence of familiarity with the subject matter; weakness in critical and analytic skills; limited or irrelevant use of literature
2.Test	Core concepts and ideas; use of appropriate statistical methods	Strong evidence of original thinking; good organization, capacity to analyse and synthesize; superior grasp of subject matter; evidence of extensive knowledge base	Evidence of grasp of subject, some evidence of critical capacity and analytic ability; reasonable understanding of issues; evidence of familiarity with literature	Some evidence of grasp of subject, little evidence of critical capacity and analytic ability; reasonable understanding of issues	Sufficient familiarity with the subject matter to enable the student to progress without repeating the case report	Little evidence of familiarity with the subject matter; weakness in critical and analytic skills; limited or irrelevant use of literature
3.Examination	Core concepts and ideas; use of appropriate statistical	Strong evidence of original thinking; good organization, capacity to analyse and	Evidence of grasp of subject, some evidence of critical capacity and	Student who is profiting from the university experience;	Sufficient familiarity with the subject matter to enable	Little evidence of familiarity with the subject matter; weakness in

	methods	synthesize; superior grasp of subject matter; evidence of extensive knowledge base	analytic ability; reasonable understanding of issues; evidence of familiarity with literature	understanding of the subject; ability to develop solutions to simple problems in the material	the student to progress without repeating the course	critical and analytic skills; limited or irrelevant use of literature
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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. Project/Assignment	Ability in using the appropriate statistical methods to solve the business problem	Strong evidence of original thinking; good organization, capacity to analyse and synthesize; superior grasp of subject matter; evidence of extensive knowledge base	Evidence of original thinking, some evidence of critical capacity and analytic ability; reasonable understanding of issues; evidence of familiarity with literature	Some evidence of original thinking, little evidence of critical capacity and analytic ability; reasonable understanding of issues	Little evidence of familiarity with the subject matter; weakness in critical and analytic skills; limited or irrelevant use of literature
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3. Examination	Core concepts and ideas; use of appropriate statistical methods	Strong evidence of original thinking; good organization, capacity to analyse and synthesize; superior grasp of subject matter; evidence of extensive knowledge base	Evidence of grasp of subject, some evidence of critical capacity and analytic ability; reasonable understanding of issues; evidence of familiarity with literature	Student who is profiting from the university experience; understanding of the subject; ability to develop solutions to simple problems in the material	Little evidence of familiarity with the subject matter; weakness in critical and analytic skills; limited or irrelevant use of literature

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. Multiple Regression Model

Formulation and assumptions of a multiple regression model. Inference of the regression parameters. General form of hypotheses testing. Sums of squares.

2. Regression Models for Quantitative and Qualitative Variables

Polynomial models. Indicator variables. Piece-wise linear regression model. Modeling interactions between quantitative and qualitative variables.

3. Model Building and Variable Selection

Standard criteria for comparing models. Cp, AIC, BIC and other criteria. Sequential F-ratios. Forward, backward and stepwise selection regression. Multi-collinearity. Regularized estimation.

4. Diagnostics and Remedial Measures

Diagnosis of residuals. Remedial actions when model assumptions are violated. Transformation of variables.

5. Analysis of Variance

ANOVA.

6. Logistic Regression

Ordered/unordered logit. Probit

7. Time Series

White Noise. Stationarity. ARMA. Heteroscedasticity.

8. Bayesian Linear Regression

Gibbs sampler, Bayesian estimation of linear regression

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.)

1.	Kleinbaum D G, Kupper L L, Muller K E and Nizam A, Applied Regression Analysis and Other Multivariable Methods, Thomson
2.	Mendenhall W and Sincich T, A Second Course in Statistics: Regression Analysis, Pearson
3.	Dielman T E, Applied Regression Analysis for Business and Economics, Duxbury
4.	Woodward W A, Gray H L, Elliott A C, Applied Time Series Analysis with R, Taylor & Francis

2.2 Additional Readings

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

Nil