

**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:	Advanced Regression Techniques
Course Code:	MS8956
Course Duration:	One Semester
Credit Units:	3
Level:	R8
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: <i>(Course Code and Title)</i>	MS8952 Introduction to Mathematical Statistics
Precursors: <i>(Course Code and Title)</i>	Nil
Equivalent Courses: <i>(Course Code and Title)</i>	Nil
Exclusive Courses: <i>(Course Code and Title)</i>	Nil

Part II Course Details

1. Abstract

This advanced Ph.D. level course delves into the essential principles and methodologies of regression models, catering to students pursuing a doctorate in the field. The curriculum encompasses a comprehensive examination of several core topics, with a focus on fostering a deep understanding of statistical techniques and their practical applications. The course begins with an in-depth exploration of OLS (Ordinary Least Squares) regression, covering finite sample properties, the Gauss-Markov theorem, hypothesis testing, generalized least squares, and large sample theory. Subsequently, students will gain expertise in panel data models, instrumental variable techniques, and the General Method of Moments (GMM) estimation. The curriculum also encompasses Bayesian Inference, facilitating a nuanced understanding of probabilistic modeling and decision-making. As a tentative component, the course may include the study of linear or nonlinear time series models and other selected topics, depending on the interests of the students and the instructor. Overall, this rigorous course aims to equip future scholars with the essential statistical tools needed to excel in the field of Business Analytics.

2. Course Intended Learning Outcomes (CILOs)

No.	CILOs	Weighting (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	A2	A3
1.	Demonstrate a comprehensive understanding of advanced regression theories and their underlying principles.		✓		
2.	Analyze and prove crucial theorems in regression, showcasing proficiency in statistical reasoning.		✓		
3.	Apply regression theory to practical applications, solving real-world problems using appropriate methodologies.			✓	✓
		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)

LTA	Brief Description	CILO No.						Hours/week (if applicable)
		1	2	3	4			
Lectures	Student will engage in in-depth discussions on course topics, understand the motivation behind each concept, and explore various models and their applications. Gain insights into important theorems, such as the Gauss-Markov theorem, and	✓	✓	✓				3 hours per week

<p>such as regression analysis, Gauss-Markov theorem, and Bayesian inference, through examination questions that require a comprehensive grasp of the subject matter.</p> <p>Assess the student's skills in analyzing and proving regression theorems during the examination. This includes demonstrating an in-depth understanding of concepts and the ability to logically present proof processes.</p> <p>Determine the student's overall mastery and application of the entire course content through a summative examination. This final assessment will measure the student's performance and achievement of all CILOs to ensure a thorough understanding of the subject.</p>								
							100%	

5. Assessment 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.Assignments	Able to apply the methodology and knowledge to solve problems.	High	Significant	Moderate	Fair	Fail to understand the core concepts
2.Examination	Evidence of knowledge of subject matter and capability to formulate, and analyse the fundamental theoretical problems in regression models.	High	Significant	Moderate	Fair	Fail to understand the core concepts

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.Assignments	Able to apply the methodology and knowledge to solve problems.	High	Significant	Moderate	Fail to understand the core concepts
2.Examination	Evidence of knowledge of subject matter and capability to formulate, and analyse the fundamental theoretical problems in regression models.	High	Significant	Moderate	Fail to understand the core concepts

Part III Other Information

1. Keyword Syllabus

1. OLS regression: finite sample properties, Gauss Markov theorem, hypothesis testing, generalized least squares, large sample theory.
2. Panel data models.
3. Instrumental Variable and General Method of Moments (GMM).
4. Bayesian Inference.
5. Tentative: linear or nonlinear time series models, other selected topics.

2. Reading List

2.1 Compulsory Readings

Nil

2.2 Additional Readings

1.	Hayashi, Fumio. <i>Econometrics</i> . Princeton University Press, 2011.
2.	Freedman, David. <i>Statistical Models: Theory and Practice</i> . Cambridge University Press, 2009.
3.	Hastie, Trevor, Robert Tibshirani, and Martin Wainwright. <i>Statistical Learning with Sparsity: The Lasso and Generalizations</i> . CRC, 2015.
4.	Hoff, Peter D. <i>A first course in Bayesian statistical methods</i> . Springer, 2009.