

**City University of Hong Kong
Course Syllabus**

**offered by College/School/Department of Management Sciences
with effect from Semester A 2018/19**

Part I Course Overview

Course Title:	Understanding Uncertainty and Statistical Reasoning
Course Code:	GE2213
Course Duration:	One Semester
Credit Units:	3
Level:	B2
Proposed Area: <i>(for GE courses only)</i>	<input type="checkbox"/> Arts and Humanities <input checked="" type="checkbox"/> Study of Societies, Social and Business Organisations <input type="checkbox"/> Science and Technology
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: <i>(Course Code and Title)</i>	Nil
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>	CB2200 Business Statistics GE2262 Business Statistics

Part II Course Details

1. Abstract

(A 150-word description about the course)

The use of statistics in the media and academe is now widespread. This course aims to equip students with a good understanding of the concept of uncertainty to help them to become informed decision-makers and critical consumers of statistical information in their future professional lives.

Uncertainty, variability and incomplete information are inherent in all disciplines. As there are minimal mathematical prerequisites for this course, students majoring in diverse disciplines will find it useful. The course content is based on real-world case studies that involve issues of current significance.

By the end of the course, students will be able to evaluate and make critical judgments about reports that involve uncertainty and statistical concepts, and will have developed the capacity to assume individual and social responsibilities.

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.	Explain the concept of uncertainty, and the uses and limitations of statistics	10%	✓	✓	✓
2.	Describe key changes in the historical development of the concept of uncertainty and statistical reasoning principles	10%	✓	✓	
3.	Critique various methods of statistical reporting used in the media in areas such as business, public administration, engineering, science, law, marketing, and the environment	20%	✓	✓	✓
4.	Apply concepts of uncertainty and statistical thinking underlying data-based arguments in various media (e.g. newspapers, magazines, video)	20%	✓	✓	✓
5.	Interpret and critically evaluate statistically-based reports in different disciplines	20%	✓	✓	✓
6.	Able to demonstrate the attitude to provide recommendations/innovations based on statistical data	20%	✓	✓	✓
		100%			

* If weighting is assigned to CILOs, they should add up to 100%.

Please specify the alignment of CILOs to the Gateway Education Programme Intended Learning outcomes (PILOs) in Section A of Annex.

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 applica ble)
		1	2	3	4	5	6	
Lectures	<ul style="list-style-type: none"> ▪ <u>Lectures</u>: Concepts and relevant knowledge of how to identify uncertainty and use basic statistical theories are explained. Students learn how to identify uncertainty and become familiar with the use of basic statistical theories. ▪ <u>Videos</u>: Videos are shown to highlight real-life examples of uncertainty. Follow-up group discussions provide students with the opportunity to critique and identify relevant statistical solutions to the examples. 	✓	✓	✓	✓	✓	✓	
Tutorials	<ul style="list-style-type: none"> ▪ <u>Case Studies</u>: Prior to class students work in groups to read and critique academic research papers or business case studies that illustrate uncertainty and demonstrate how statistics are used in the real world. In class students brainstorm possible answers to questions arising from various case study problems before giving a brief presentation of their findings, their critiques and recommendations. ▪ <u>Group Discussion</u>: Students work in groups to research and discuss the latest issues related to uncertainty and statistics. Students conduct a critical evaluation and make informed contributions to tutorial discussions on the basis of background reading. ▪ <u>Group Project</u>: Students work in groups to study the statistics published in the Hong Kong Annual Digest of Statistics. They are required to identify the relevant data relating to critical social, economic or environmental problems in Hong Kong. Students need to understand the terms used in the Hong Kong Annual Digest of Statistics. They also need to decide how to present the important/significant information graphically so as to be able to clearly describe the trends or observable characteristics. The students are encouraged to identify and interpret the relationships between the selected topics. Finally, they are required to 			✓	✓	✓	✓	

	provide recommendations/innovations to corresponding government departments which suggest ways to improve the living standard and social environment in Hong Kong.							
Outside Classroom Activities	<ul style="list-style-type: none"> ▪ <i>Company Visit</i>: These may include visits to the Hong Kong Government Census and Statistics Department; a marketing research company, the analytic department of firms in the banking and/or other industries, etc. ▪ <i>Consultations</i>: Additional help is provided to individuals and groups outside official class time within advertised hours. 			✓		✓	✓	

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	5	6		
Continuous Assessment: <u>100</u> %								
Quiz	✓	✓	✓	✓	✓		40%	
Group Project			✓	✓	✓	✓	30%	
Case Study			✓	✓	✓	✓	10%	
Assignment	✓	✓	✓	✓	✓		20%	
Examination: <u>0</u> % (duration: _____, if applicable)								
* The weightings should add up to 100%.							100%	

5. Assessment Rubrics

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

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Quiz	Level of understanding of statistical concepts, sampling methods and statistical modelling featured in lectures and indicated readings.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Group Project	Level of effective presentation and communication and with flair in oral and electronic format; Excellence coverage of materials and contents and demonstrates time management skills; quality answers to questions raised during presentation.	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Case Study	Level of evidence of applying statistical knowledge and critical thinking to evaluate statistics-related findings.	High	Significant	Moderate	Basic	Not even reaching marginal levels
4. Assignment	Level of evidence of critical capacity and analytic ability; understanding of concepts	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

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

Uncertainty and variability; logic of uncertainty; the uses of uncertainty; measuring uncertainty; what are statistics; statistical concepts and reasoning; data-based arguments; “data sense” development, modern use of statistics, limitations of statistics; current affairs; media, interpret and critique statistically-based reports.

The following is an indicative of likely modules and topics students will undertake to learn in this course. Final details and specific reading materials for specific topics will be provided to students in their first week of attendance in this course.

Module 1: Introduction

- What is uncertainty?
- The role of uncertainty in people’s lives
- Approaches to uncertainty – probabilistic, fuzzy logic, ...
- Historical development of the concept of uncertainty and statistical reasoning principles
- Statistics concepts relating to post-renaissance modernization
- Statistics as data and as methodology
- Data vs information: a distinction between data on the individual entity and statistics

Module 2: Understanding Uncertainty

- Uncertainty about specific future, present, or past events
- Uncertainty about the parameters within models
- Uncertainty about the structure of models
- Uncertainty about the relevance to particular problems of the entire modeling process

Module 3: Case studies and applications

3.1 Applications in business management

- Investment strategies: trends, moving average and noise
- Premium estimation: pricing of insurance products
- Utility functions: how to make decisions
- Quality management: reliability, six-sigma

3.2 Applications in science and technology

- Ignorance, chaos and quantum mechanics: causes of randomness
- Evolution, genes, and viruses: randomness in biology
- Medical decision making: specificity and sensitivity
- Spam, probability, and spam: blocking unwanted e-mail

3.3 Applications in everyday life

- Commonly encountered social and economic statistics
- Fifty-one percent to forty-nine percent: the true meaning of polls
- Laying down the law: why casinos always win
- Final exam: do you have probability perspective?

Module 4: Statistical concepts and reasoning

- Use of statistics to support claims or positions
- Common errors in the use and presentation of numerical measures
- Making judgments from surveys and experiments

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.	Lindley D V, <u>Understanding Uncertainty</u> , Latest edition, Wiley
2.	Best J, <u>Damned Lies and Statistics</u> , Latest edition, University of California Press
3.	Moore D S and Notz W I, <u>Statistics: Concepts and Controversies</u> , Latest edition, New York: W.H. Freeman
4.	Rosenthal J S, <u>Struck by Lightning</u> , Latest edition, Joseph Henry Press
5.	Utts J M, <u>Seeing Through Statistics</u> , Latest edition, Brooks/Cole, Thomson
6.	Tanur J, <u>Statistics: A Guide To The Unknown</u> , Latest edition, Wiley
7.	Stigler (1986): <u>The History of Statistics: The Measurement of Uncertainty before 1900</u> , The Belknap Press of the Harvard University Press. Cambridge, Massachusetts
8.	Stigler (1999): <u>Statistics on the Table: The History of Statistical Concepts and Methods</u> , Harvard University Press. Cambridge, Massachusetts
9.	David (1962): <u>Games, Gods and Gambling</u> , Republished by Dover in 1998.

2.2 Additional Readings

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

1.	<u>Chance</u> , American Statistical Association
2.	<u>Stats: The Magazine For Students of Statistics</u> , American Statistical Association
3.	<u>Annual Digest of Statistics</u> , Latest issue, Census and Statistics Department, HKSAR Government
4.	Grier (2006): <u>When Computers Were Human</u> , Princeton University Press
5.	<u>Understanding Uncertainty</u> http://understandinguncertainty.org/
6.	American Statistical Association http://www.amstat.org/
7.	Royal Statistical Society http://www.rss.org.uk/
8.	Statistical Society of Canada http://www.ssc.ca/
9.	Statistical Society of Australia http://www.statsoc.org.au/
10.	Hong Kong Statistical Society http://www.hkss.org.hk/
11.	Census and Statistics Department, HKSAR Government http://censtatd.gov.hk

A. Please specify the Gateway Education Programme Intended Learning Outcomes (PILOs) that the course is aligned to and relate them to the CILOs stated in Part II, Section 2 of this form:

GE PILO	Please indicate which CILO(s) is/are related to this PILO, if any (can be more than one CILOs in each PILO)
PILO 1: Demonstrate the capacity for self-directed learning	✓
PILO 2: Explain the basic methodologies and techniques of inquiry of the arts and humanities, social sciences, business, and science and technology	✓
PILO 3: Demonstrate critical thinking skills	✓
PILO 4: Interpret information and numerical data	✓
PILO 5: Produce structured, well-organised and fluent text	
PILO 6: Demonstrate effective oral communication skills	✓
PILO 7: Demonstrate an ability to work effectively in a team	✓
PILO 8: Recognise important characteristics of their own culture(s) and at least one other culture, and their impact on global issues	
PILO 9: Value ethical and socially responsible actions	
PILO 10: Demonstrate the attitude and/or ability to accomplish discovery and/or innovation	✓

GE course leaders should cover the mandatory PILOs for the GE area (Area 1: Arts and Humanities; Area 2: Study of Societies, Social and Business Organisations; Area 3: Science and Technology) for which they have classified their course; for quality assurance purposes, they are advised to carefully consider if it is beneficial to claim any coverage of additional PILOs. General advice would be to restrict PILOs to only the essential ones. (Please refer to the curricular mapping of GE programme: http://www.cityu.edu.hk/edge/ge/faculty/curricular_mapping.htm.)

B. Please select an assessment task for collecting evidence of student achievement for quality assurance purposes. Please retain at least one sample of student achievement across a period of three years.

Selected Assessment Task
Quiz Group Project Presentation Individual Assignment