

**City University of Hong Kong
Course Syllabus**

**offered by Department of Economics and Finance
with effect from Semester A 2022 /23**

Part I Course Overview

Course Title: Mathematics and Statistics for Financial Services

Course Code: EF5370

Course Duration: 1 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 aims to equip students with the quantitative skills to carry out analysis in the insurance profession and to develop students' creativity and originality through teaching, learning, and assessment tasks. The lectures encourage students to raise questions, apply innovative approaches, and discover optimal ways to deal with problems through in-class participation and discussion, which will also enhance students' understanding of mathematical concepts.

Students are required to apply fundamental mathematical concepts to solve real world cases and designed scenarios. A final interpretation of the numerical solution with economic concepts shows the accomplishment of students' ability to discover and innovate.

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 the fundamental concepts of interest theory, probability and risk measures. Students are encouraged to discover the underlying probability theories in real-world cases and/or designed scenarios.	30%	√	√	
2.	Understand the basic concepts in life and non-life insurance mathematics. The attitude and ability of discovery and innovation are developed in deriving the mathematical solution to some insurance exercises.	35%	√	√	
3.	Apply various mathematical methods in life and non-life insurance in an innovative way. The mathematical solutions need to be supported by sound economic interpretations.	35%	√	√	√
		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	To provide basic concepts and structure of interest, probability, life and non-life insurance theories.	√	√	√	-
In-class exercise, homework	To give students hands-on experience with applications of concepts. Students are encouraged to apply mathematical concepts to solve real world problems. It helps cultivate students' attitudes to innovate and apply.	√	√	√	-
Examination	To assess the students' understanding of mathematical methods in finance and insurance, and the ability to apply them and make innovations.	√	√	√	-

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: <u>50</u> %					
In-class exercise, homework	√	√	√	50 %	
Examination: <u>50</u> % (duration: 2 hours , if applicable)					
Examination	√	√	√	50 %	
				100%	

Students are required to pass both coursework and examination components in order to pass the course.

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. In-class exercise, homework	Demonstrate the capability of applying the mathematical concepts and methods to tackle some problem-solving questions or exercises as assigned by the lecturer.	High	Significant	Basic	Not even reaching marginal levels
2. Examination	Demonstrate having good understanding of the mathematical concepts and methods in relation to finance and insurance business as well as the capability of applying them and making innovation.	High	Significant	Basic	Not even reaching marginal levels

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. In-class exercise, homework	Demonstrate the capability of applying the mathematical concepts and methods to tackle some problem-solving questions or exercises as assigned by the lecturer.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Examination	Demonstrate having good understanding of the mathematical concepts and methods in relation to finance and insurance business as well as the capability of applying them and making innovation.	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

- 1) Review of Interest Theory
 - a) Simple interest, Compound interest
 - b) Future value, Present value, Net present value, Discount rate
 - c) Annuities
- 2) Overview of Probability
 - a) Random variables
 - b) Probability densities
 - c) Univariate and multivariate probability distributions
 - d) Covariance and correlation coefficients
- 3) Life Insurance Mathematics
 - a) The life table
 - b) Life annuities
 - c) Life insurance
- 4) Non-life Insurance Mathematics
 - a) The collective risk models
 - b) Introduction to stochastic processes

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.	<i>Fundamentals of Actuarial Mathematics</i> , 2 nd ed. (2011), by S. David Promislow, John Wiley & Sons
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2.2 Additional Readings

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

1.	<i>Risk Management and Insurance</i> , current edition, by A. E. Harrington and G. R. Niehaus, McGraw-Hill
2.	Section 1 (Interest Theory) <i>The Theory of Interest</i> , 3 rd ed. (2009), by S. G. Kellison, Irwin/McGraw-Hill
3.	Section 2 (Probability) <i>A First Course in Probability</i> , 8 th ed. (2009), by S. M. Ross
4.	Section 3 (Life Insurance and Risk) <i>Life Insurance Mathematics</i> , 3 rd ed. (1997), by H. Gerber, Springer-Verlag
5.	Section 4 (Non-life Insurance) <i>Non-life Insurance Mathematics: An Introduction with Stochastic Processes</i> , (2004), by Thomas Mikosch, Springer