City University of Hong Kong

Information on Course
offered by Department of Economics and Finance
with effect from Semester A in 2013 / 2014

Part I

Course Title: Mathematics and Statistics for Financial Services

Course Code: EF5370

Course Duration: 1 semester

Credit Units: 3

Level: P5

Medium of Instruction: English

Prerequisites: Nil

Precursors: Nil

Equivalent Courses: Nil

Exclusive Courses: Nil

Part II

Course Aims

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.

Course Intended Learning Outcomes (CILOs)
Upon successful completion of this course, students should be able to:

No.	CILOs	Weighting (if applicable)
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%

Teaching and Learning Activities (TLAs)
(Indicative of likely activities and tasks designed to facilitate students' achievement of the CILOs. Final details will be provided to students in their first week of attendance in this course)

CILO No.	TLAs	Functions	Hours/week (if applicable)
CILOs 1, 2 & 3	Lecture	To provide basic concepts and structure of interest, probability, life and non-life insurance theories.	
CILOs 1, 2 & 3	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.	
CILOs 1, 2 & 3	Examinations	To assess the students' understanding of mathematical methods in finance and insurance, and the ability to apply them and make innovations.	

Assessment Tasks/Activities
(Indicative of likely activities and tasks designed to assess how well the students achieve the CILOs. Final details will be provided to students in their first week of attendance in this course)

Final examination (2 hours)	50%
Coursework	50%
Total	100%

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

Constructive Alignment of CILOs and Assessment Methods

CILO No.	Type of Assessment Tasks/Activities	Weighting (if applicable)	Remarks
CILOs 1, 2 & 3	In-class exercise, homework	50%	
CILOs 1, 2 & 3	Examinations	50%	

Summary of how DEC is incorporated in Assessment Tasks, and Teaching and Learning Activities (TLAs)

DEC Elements	ATs and TLAs
Develop students' attitude to discover and innovate	• In-class discussions and lectures • Exercises and homework questions
Enhance students' abilities to discover and innovate	• Exercises • Synthesis of mathematic, financial, and insurance concepts
Accomplishments of discovery and innovation	Real world problems in course works and the final exam

Grading of Student Achievement

Letter Grade	Grade Points	Grade Definitions	Remarks
A+ A A-	4.3 4.0 3.7	Excellent	Strong evidence of the understanding of the statistical concepts and the ability to apply the mathematical methods in the relevant context. Students have demonstrated very strong overall ability to discover and innovate, and showed very strong evidence of accomplishments of discovery.
B+ B B-	3.3 3.0 2.7	Good	Evidence of the understanding of the statistical concepts and the ability to apply the mathematical methods in the relevant context. Students have demonstrated strong overall ability to discover and innovate, and showed strong evidence of accomplishments of discovery.
C+ C C-	2.3 2.0 1.7	Adequate	Some evidence of the understanding of the statistical concepts and the ability to apply the mathematical methods in the relevant context. Students have demonstrated some ability to discover and innovate, and showed satisfactory evidence of accomplishments of discovery.
D	1.0	Marginal	Basic familiarity with the subject matter in examinations. Students have demonstrated marginal ability to discover and innovate, and showed marginal evidence of accomplishments of discovery.

F	0.0	Failure	Little evidence of familiarity with the subject matter. Students have demonstrated little ability to discover and innovate, and showed marginal evidence of accomplishments of discovery.

Part III

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

Recommended Readings

Textbooks

Fundamentals of Actuarial Mathematics, 2nd ed. (2011), by S. David Promislow, John Wiley & Sons

Supplementary Readings

Risk Management and Insurance, current edition, by A. E. Harrington and G. R. Niehaus, McGraw-Hill

Section 1 (Interest Theory)

The Theory of Interest, 3rd ed. (2009), by S. G. Kellison, Irwin/McGraw-Hill

Section 2 (Probability)

A First Course in Probability, 8th ed. (2009), by S. M. Ross

Section 3 (Life Insurance and Risk)

Life Insurance Mathematics, 3rd ed. (1997), by H. Gerber, Springer-Verlag

Section 4 (Non-life Insurance)

Non-life Insurance Mathematics: An Introduction with Stochastic Processes, (2004), by Thomas Mikosch, Springer