City University of Hong Kong

Information on a Course
offered by Department of Mathematics
with effect from Semester A in 2008 / 2009

Part I

Course Title: Mathematical Methods in Finance

Course Code: MA5182

Course Duration: One Semester

No. of Credit Units: 3

Level: P5

Medium of Instruction: English

Prerequisites: Nil

Precursors: Nil

Equivalent Courses: Nil

Exclusive Courses: Nil

Part II

1. **Course Aims:**

   This course provides fundamental concepts and basic techniques in probability theory and stochastic calculus and their applications in finance. It helps students understand the mathematical concepts and grasp the basic techniques in probability theory, stochastic processes and Ito calculus. It also develops their ability of applying the knowledge to problems in finance.

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

No.	CILOs	Weighting (if applicable)
1.	explain clearly concepts from advanced probability and stochastic calculus.	2
2.	formulate financial phenomena in terms of Brownian motions and stochastic processes.	3
3.	check solutions for stochastic differential equations with Ito's formula.	2
4.	describe Black-Scholes option pricing theory quantitatively.	2
5.	apply mathematical methods to price contingent claims and derive analytic relations among financial variables.	2
6.	the combination of CILOs 1-5	2

3. Teaching and learning Activities (TLAs)
(designed to facilitate students' achievement of the CILOs)

Indicative of likely activities and tasks students will undertake to learn in this course. Final details will be provided to students in their first week of attendance in this course.

TLAs	CILO No.	Hours/week
Learning through **teaching** is primarily based on lectures.	1--6	32 hours in total
Learning through **tutorials** is primarily based on interactive problem solving allowing instant feedback.	1	2 hours
	2	2 hours
	3	1 hour
	4	1 hour
	5	1 hour
Learning through **take-home assignments** helps students understand advanced probability theory, stochastic processes, Ito's stochastic calculus and simple applications in modeling financial markets.	1--5	after-class

4. Assessment Tasks/Activities
(designed to assess how well the students achieve the CILOs)

40% Coursework
60% Examination (Duration: 2 hours, at the end of the semester)

Assessment Tasks/Activities	CILO No.	Weighting (if applicable)	Remarks
Test	1--4	20-40%	Questions are designed for the first part of the course to see how well the students have learned concepts of advanced probability, stochastic calculus and their applications in modeling financial phenomena.
Hand-in assignments	1--5	0-20%	These are skills based assessment to help students understand advanced concepts of probability, stochastic calculus and some applications in option pricing.
Examination	6	60%	Examination questions are designed to see how far students have achieved their intended learning outcomes. Questions will primarily be skills and understanding based to assess the student's versatility in probability theory and stochastic calculus.
Formative take-home assignments	1--5	0%	The assignments provide students chances to demonstrate their achievements on applying concepts of advanced probability and stochastic calculus in mathematical finance learned from this course.

5. Grading of Student Achievement: Refer to Grading of Courses in the Academic Regulations for Taught Postgraduate Degrees.

Part III

Keyword Syllabus:

Random variables. Expectation. Conditional probability. Martingales. Brownian motions. Markov processes. Ito rule. Stochastic differential equations. Black-Scholes option pricing model. Pricing contingent claims.

Recommended Reading:
Text(s):

Online Resources: