City University of Hong Kong
Course Syllabus

offered by College/School/Department of Mathematics
with effect from Semester A 20 22 / 23

Part I Course Overview

Course Title:	**Stochastic Analysis in Finance**
Course Code:	**MA5618**
Course Duration:	**1 semester**
Credit Units:	**3 CUs**
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 introduce concepts and techniques in advanced probability theory and discrete time stochastic processes, as well as their applications to the real-world financial models and risk analysis. It introduces some fundamental concepts in Markov process, Martingales, Change of measure, and provides a needed preparation for its subsequent course "Advanced Stochastic Analysis in Finance".

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.	Understanding the notions of martingales and Markov chains in discrete time, based on the rigorous framework of probability theory, with a view to analyzing real-world processes.	25	✓		
2.	Knowing how to use the no-arbitrage method of option pricing in a binomial model for various derivatives.	25	✓	✓	
3.	Being able to express the risk-neutral pricing in terms of martingales and Markov processes, and understanding the change of measure associated with pricing of derivatives of European type.	25	✓	✓	✓
4	Understanding the concept of stopping times, in connection with pricing of derivatives of American type, and other exotic options.	25	✓	✓	✓
		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	4	5	**6**	
teaching	Learning through teaching is primarily based on lectures.	✓	✓	✓	✓			3 hours/week
take-home assignments	Learning through take-home assignments helps students implement advanced theory for better understanding	✓	✓	✓	✓			After-class

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: _30___%								
Test	✓	✓					20	
Hand-in assignments	✓	✓	✓	✓			10	
Examination	✓	✓	✓	✓			70	
Examination: _70___% (duration: 3 hrs, if applicable)								
							100%	

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. Test	Problem solving ability	High	Significant	Basic	Not even reaching marginal levels
2. Hand-in assignments	Comprehensive understanding	High	Significant	Basic	Not even reaching marginal levels
3. Examinations	Creativity and problem solving ability based on comprehensive understanding	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. Test	Problem solving ability	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Hand-in assignments	Comprehensive understanding	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Examinations	Creativity and problem solving ability based on comprehensive understanding	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.)

Risk-neutral pricing, Martingale, Binomial model, Arbitrage, Delta Hedging

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.	Course materials provided
2.	
3.	
…	

2.2 Additional Readings

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

1.	Stochastic Calculus for Finance I, by Steven Shreve, Springer; 2004th edition
2.	
3.	
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