

**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: Financial Mathematics in Derivative Markets

Course Code: MA5616

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 is an introductory course in financial mathematics. With this course, we provide a blend of the economics and mathematics on the topics of derivatives pricing and the related risk analysis. The content is easily accessible to all students from different disciplines to quickly grasp the essential financial concepts based on the knowledge in calculus and statistics.

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 clearly financial concepts of various derivatives: forwards; swaps; vanilla/exotic options; fixed income products.	20	✓		
2.	formulate derivative pricing on discrete time model based on the arbitrage theory	20	✓	✓	
3.	introduce Ito calculus to formulate risk-neutral price on continuous time model; mathematical derivation is mostly calculation based formulation, and a rigorous mathematical theory of Ito integral is not required.	20	✓	✓	
4	Understand Black-Scholes equation and related concepts in option Greeks and its implications in risk analysis.	20	✓	✓	✓
5	Introduce the concept of risk measure, implement risk assessment of a given portfolio underlying a probability distribution	20	✓	✓	
		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.)

Arbitrage theory, Hedging, Binomial model, Ito's formula, Black-Scholes equation, Option Greeks, Value at Risk

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.	
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2.2 Additional Readings

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

1.	Derivatives Markets, by R. McDonald 3 rd Edition, Pearson
2.	Options, Futures and Other Derivatives, by J. Hull, 11 th Edition, Pearson
3.	
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