

**City University of Hong Kong  
Course Syllabus**

offered by College/School/Department of Mathematics  
with effect from Semester A 2020 / 21

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**Part I Course Overview**

<b>Course Title:</b>	<b>Introductory Mathematical Finance</b>
<b>Course Code:</b>	<b>MA3521</b>
<b>Course Duration:</b>	<b>One semester</b>
<b>Credit Units:</b>	<b>3</b>
<b>Level:</b>	<b>B3</b>
<b>Proposed Area:</b> <i>(for GE courses only)</i>	<input type="checkbox"/> <b>Arts and Humanities</b> <input type="checkbox"/> <b>Study of Societies, Social and Business Organisations</b> <input type="checkbox"/> <b>Science and Technology</b>
<b>Medium of Instruction:</b>	<b>English</b>
<b>Medium of Assessment:</b>	<b>English</b>
<b>Prerequisites:</b> <i>(Course Code and Title)</i>	<b>MA2506 Probability and Statistics; or MA2510 Probability and Statistics</b>
<b>Precursors:</b> <i>(Course Code and Title)</i>	<b>Nil</b>
<b>Equivalent Courses:</b> <i>(Course Code and Title)</i>	<b>Nil</b>
<b>Exclusive Courses:</b> <i>(Course Code and Title)</i>	<b>Nil</b>

## Part II Course Details

### 1. Abstract

(A 150-word description about the course)

This course introduces students to the financial instruments used in modern financial practice, particularly forward contracts and options. The emphasis is on developing the concept of risk-neutrality and the financial and mathematical theory underlying the behavior of these financial instruments and preparing students with knowledge to solve related problems. Students should have a basic understanding of probability concepts to be properly prepared for this course.

### 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 <sup>#</sup>	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	A2	A3
1.	explain the concept of a forward contract, a call option and a put option, and recognize the mathematical and logical relationships among them.		Y		
2.	apply the concept of no-arbitrage to the pricing of forward contracts.		Y	Y	
3.	describe the various basic option strategies and their objectives.		Y	Y	Y
4.	explain the concept of risk-neutrality and risk-free rate of interest.		Y	Y	
5.	construct a binomial tree for stock prices and apply it to evaluate the no-arbitrage price of an option and the assumptions needed for the price to be valid.		Y	Y	Y
		100%			

\* If weighting is assigned to CILOs, they should add up to 100%.

<sup>#</sup> Please specify the alignment of CILOs to the Gateway Education Programme Intended Learning outcomes (PILOs) in Section A of Annex.

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		
Lecture	Learning through <b>teaching</b> is primarily based on lectures.	Y	Y	Y	Y	Y		39 hours in total
Take-home assignments	Learning through <b>take-home assignments</b> helps students implement fundamental concepts and theory of financial instruments as well as model their applications in financial markets.	Y	Y	Y	Y	Y		after-class
Math Help Centre	Learning through <b>project</b> helps students apply principles of quantitative finance and financial economics to analyze financial instruments in contemporary financial markets. It also helps students to communicate and collaborate effectively in the team.	Y	Y	Y	Y	Y		after-class

### 4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

30% Coursework

70% Examination (Duration: 3 hours, at the end of the semester)

For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

Assessment Tasks/Activities	CILO No.						Weighting*	Remarks
	1	2	3	4	5			
Continuous Assessment: <u>30</u> %								
Test	Y	Y	Y				15--30%	Questions are designed for the first part of the course to see how well the students have learned mathematical concepts of forward contracts and options, as well as techniques of derivatives pricing.

Hand-in assignments	Y	Y	Y	Y	Y		0--15%	These are skills based assessment to help students implement basic concepts of quantitative finance, mathematical theory and pricing strategies of financial instruments.
Project	Y	Y	Y	Y	Y		0--15%	Students are assessed on their ability in applying techniques and theory of mathematical finance to analyze financial instruments/derivatives products in current financial practice.
Examination: <u>70</u> % (duration: 3 hrs, if applicable)								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 theory of financial instruments and derivatives pricing.
							100%	

\* The weightings should add up to 100%.

## 5. Assessment Rubrics

*(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)*

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Test	ABILITY to APPLY the fundamental concepts and methodology for problem solving	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Hand-in assignments	CAPACITY for SELF-DIRECTED LEARNING to understand and apply different methods	High	Significant	Moderate	Basic	Not even reaching marginal levels
4. Project	CAPACITY for SELF-DIRECTED LEARNING to understand and apply different methods	High	Significant	Moderate	Basic	Not even reaching marginal levels
5. Examination	ABILITY to APPLY the fundamental concepts and methodology for the comprehensive problem solving	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.)*

- Forward contracts, option contracts, payoff, profit and arbitrage;
- Option strategies and combinations;
- Interest rate and bond basics, interest rate swaps;
- Put-call parity on options;
- Binomial option pricing model;
- Black-Scholes option pricing model (if time permits)

**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.	Robert L. McDonald, <i>Derivatives Markets</i> . Addison-Wesley, 2006.
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3.	
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**2.2 Additional Readings**

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

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2.	
3.	
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