



FINA4354 Financial Engineering

First Semester of 2022-23

GENERAL INFORMATION	
<p>Instructor: Dr. BUEHLMAIER, Matthias</p> <p>Email: buehl-teaching [at] hku [dot] hk Office: Room 1106, 11/F, K.K. Leung Building Phone: 2219 4177</p> <p>Consultation times (tentative): Wednesdays from 4:00 p.m. to 7:00 p.m. To allow for better preparation, students should email the instructor a brief description of the consultation topics they wish to discuss at the latest on the day before the consultation. Students who cannot attend the consultation hours due to a time clash with other courses/tutorials may request a separate consultation time.</p> <p>Tutor: To be determined (if any)</p> <p>Course website: Moodle via HKU Portal Other important details: None</p>	
COURSE DESCRIPTION	
<p>Financial engineering is the process of constructing new instruments by using bonds and individual derivatives such as forwards, calls, puts, and exotic options as basic building blocks. The process involves designing, pricing, and managing the instruments. In this course, we anatomize a few popular structured products. We then discuss how to price these products by studying the price of the embedded exotic options. We study the risk exposure of the investors and the risk management of the issuer. We also discuss some topics on the market for volatility trading, numerical methods for option-pricing, and models beyond Black-Scholes.</p> <p>Pre-requisite(s): FINA0402 / FINA3350 Mathematical Finance Co-requisite(s): None Mutually exclusive: None</p>	
COURSE OBJECTIVES	
<ol style="list-style-type: none"> 1. Provide students with career opportunities in financial engineering. 2. Enable students to structure products that take into account investors' preferences by matching them with particular payoff structures. 3. Provide students with in-depth understanding of structured products that can be profitably applied in the finance industry. 4. Help students avoid potential pitfalls when modeling complex derivatives products. 	
FACULTY LEARNING GOALS (FLGs)	
<p>FLG1: Acquisition and internalization of knowledge of the programme discipline FLG2: Application and integration of knowledge FLG3: Inculcating professionalism FLG4: Developing global outlook FLG5: Mastering communication skills FLG6: Cultivating leadership</p>	
COURSE LEARNING OUTCOMES (CLOs)	
Course Learning Outcomes	Aligned Faculty Learning Goals (FLGs)
CLO1: Learn how to anatomize a traded structured product	FLGs 1, 2, 3, 4, 6
CLO2: Learn how to price and hedge embedded exotic options.	FLGs 1, 2, 3, 4, 6
CLO3: Understand how to design a new structured product by applying option pricing theory.	FLGs 1, 2, 3, 4, 6
CLO4: Be familiar with volatility trading.	FLGs 1, 2, 3, 4, 6

CLO5: Be able to make convincing and coherent presentations.		FLGs 3, 5 & 6	
CLO6: Be able to speak and write effectively, using the terminology of financial engineering.		FLGs 3, 5 & 6	
COURSE TEACHING AND LEARNING ACTIVITIES			
Course Teaching and Learning Activities	Expected Study Hours	Study Load (% of study)	
T&L1: Lectures	36	26.5%	
T&L2: Review questions and/or assignments	20	14.7%	
T&L3: Tutorials (depending on class size, there may or may not be a tutorial)	12	8.8%	
T&L4: Self-study	48	35.3%	
T&L5: Group project	20	14.7%	
Total	136	100%	
Assessment Methods			
		Weight	Aligned Course Learning Outcomes
A1: Midterm exam		30%	CLO 1, 2, 3, 4
A2: Group project: Individual presentation		15%	CLO 5, 6
A3: Group project: Group report		25%	CLO 1, 2, 3, 4
A4: Final exam		30%	CLO 1, 2, 3, 4
	Total	100%	
Coursework / Examination Ratio: <u>70</u> % / <u>30</u> %			
STANDARDS FOR ASSESSMENT			
Course Grade Descriptors			
A+, A, A-	Exhibited high level of understanding of the course materials through excellent performance in class discussion, assignments, presentations and exams.		
B+, B, B-	Exhibited reasonably high level of understanding of the course materials through good performance in class discussion, assignments, presentations and exams.		
C+, C, C-	Exhibited fair level of understanding of the course materials.		
D+, D	Evidence of basic familiarity with the subject.		
F	Candidate has demonstrated a poor grasp of the subject with evidence of largely inaccurate understandings of principles, concepts and arguments presented within this course.		
Assessment Rubrics for Each Assessment			
In-Class and Tutorial Performance			
A+, A, A-: Extremely well prepared for class discussion, very active in sharing views and attended almost all lectures and tutorials.			
B+, B, B-: Partially prepared for class discussion, quite active in sharing views and attended most of the lectures and tutorials.			
C+, C, C-: Not well prepared for class discussion, limited active in sharing views and attended many of the lectures and tutorials.			
D+, D: Not well prepared for class discussion, no sharing of views and attended some of the lectures and			

tutorials.

F: Poorly prepared for class discussion and no sharing of views and experience and rarely attended lectures and tutorials.

Group Project: Individual Presentation

A+, A, A-: Professional presentation style, comprehensive content coverage, well-articulated on critical issues, effective use of management concepts, and quality interaction with audience.

B+, B, B-: Decent presentation style, appropriate content coverage, clear discussion of critical issues, moderately effective use of management concepts, and acceptable interaction with audience.

C+, C, C-: Mediocre presentation style, limited content coverage, marginally acceptable discussion of critical issues, infrequent use of management concepts, and limited interaction with audience.

D+, D: Weak presentation style, key content omitted, unclear focus on critical issues, very limited use of management concepts, and poor interaction with audience.

F: Unacceptable presentation style, questionable content coverage, omitting critical issues, zero use of management concepts, and no interaction with audience.

Group Project: Group Report

A+, A, A-: The financial product's economic motivation is extremely well presented, its pricing methodology is extremely efficient, and its hedging strategy is extremely effective.

B+, B, B-: The financial product's economic motivation is very well presented, its pricing methodology is very efficient, and its hedging strategy is very effective.

C+, C, C-: The financial product's economic motivation is presented in a mediocre way, its pricing methodology is moderately efficient, and its hedging strategy is moderately effective.

D+, D: The financial product's economic motivation is not presented well, its pricing methodology is not efficient, or its hedging strategy is not effective.

F: The financial product's economic motivation is nonsensical, its pricing methodology is wrong, or its hedging strategy is flawed.

Midterm and Final Exam

A+, A, A-: Idea development is insightful and sophisticated; Supporting evidence is convincing, accurate and detailed. Well written with clear focus.

B+, B, B-: Idea development is clear and thoughtful; Supporting evidence is sufficient and accurate. Well written.

C+, C, C-: Idea development is simplistic and lacking in relevance; Supporting evidence insufficient but accurate. Somewhat well written.

D+, D: Idea development is superficial and ineffective; Supporting evidence is insufficient and inaccurate. Writing is unclear.

F: Idea development is absent; Supporting evidence is vague or missing. Poorly written.

COURSE CONTENT AND TENTATIVE TEACHING SCHEDULE

The following topics will be covered based on the tentative schedule below:

- Introduction (finish in class 1)
- Option trading strategies (review material)
- Exotic options (review material)
- Arbitrage theory (finish in class 2)
- Introduction to R (finish in class 4)
- Monte Carlo methods (finish in class 6)
- Structured products (finish in class 7)
- Capital guarantee products (finish in class 7)
- Barrier options (finish in class 9)
- Swaps and volatility trading (finish in class 10)
- Credit derivatives (finish in class 10)
- Finite difference methods (if time permits)
- Presentations (in the last class and, depending on final enrollment figures, maybe in the second-to-last class)

REQUIRED/RECOMMENDED READINGS & ONLINE MATERIALS

Recommended Textbook:

Wilmott, P., 2007, Paul Wilmott Introduces Quantitative Finance, 2nd edition, Wiley.

MEANS/PROCESSES FOR STUDENT FEEDBACK ON COURSE

Conducting mid-term survey in additional to SETL around the end of the semester

Online response via Moodle site

Others: _____ (please specify)

COURSE POLICY

Class Conduct

Students are required to attend all classes on time. If you miss a class, it is entirely your responsibility for what you have missed. In case you have to leave the class early, please inform the instructor beforehand and leave quietly.

No use of mobile phone or chatting is allowed when the class is in session. Remember to turn off or mute the phone before each session. The instructor has the discretion to give penalty in case of class misconduct.

Respect your instructors and your fellow students. Be considerate to others.

Academic Dishonesty

Plagiarism and misconduct cases will be permanently recorded in the School of Economics and Finance for future reference.

The University Regulations on academic dishonesty will be strictly enforced! Please check the University Statement on plagiarism on the web: <http://www.hku.hk/plagiarism/>

Academic dishonesty is any act that misrepresents a person's own academic work or that compromises the academic work of another. It includes (but not limited to) cheating on assignments or examinations; plagiarizing, i.e., representing someone else's ideas as if they are one's own; sabotaging another's work.

If you are caught in an act of academic dishonesty or misconduct, you will receive an "F" grade for the subject. The relevant Board of Examiners may impose other penalty in relation to the seriousness of the offense.

To avoid intellectual property and copyright infringement, and/or violation of the Personal Data (Privacy) Ordinance, **DO NOT upload** HKU teaching-related materials including but not limited to course materials, marking schemes, examination papers, etc. to websites. If you have done so in the past, you are asked to take steps to take down relevant materials immediately.

ADDITIONAL COURSE INFORMATION

- Announcement, assignments, and lecture slides will be posted on the course website. Hard copy of lecture notes will not be provided.
- No late assignments will be accepted.
- Special examinations are not granted to students taking up summer internships. Please avoid starting your internships before the end of the examination period.