UNIVERSITY OF ECONOMICS AND LAW

FACULTY OF ECONOMICS MATHEMATICS

COURSE SYLLABUS

General information

Course title	**Financial mathematics 1**
Course code	MAT1009
Type of course	Compulsory
Level of course	Undergraduate (first cycle Bachelor)
Year of study	2rd year
Semester	Semester 4
Number of credits	3 credits
Pre-requisites	Mathematics for Economics and Business, Probability theory, Applied Statistics
Co-requisites	NA
Language of instruction	English
Level of using English in instruction	100% (materials, teaching/learning activities, assignments, examinations, projects).
Mode of delivery	Face-to-face
Lecturer(s)	Dr. Le Thi Thanh An – Faculty of Economics Mathematics, UEL – VNU. Email address: anltt@uel.edu.vn Dr. Le Phuong – Faculty of Economics Mathematics, UEL – VNU. Email address: phuongl@uel.edu.vn Mr. Tran Viet Thang, ACB Bank. Email address: thangtv.ktl@uel.edu.vn

Course content

Financial mathematics provides students strong background on financial market, financial products and their relevant mathematical models. Not only building practical knowledge, the module trains several specific skills and attitudes, so that the students can apply in financial sector.

In the first part, the course will cover all relevant concepts, such as financial products in financial market. In the second part, we are going to detailed computation concerning interest rates; cash flows; bond and bond pricing; duration of bond portfolios; forward and future prices; valuation of forward or future contracts; swaps and valuation of swaps. We use Excel to help with complex computation.

	Content	Number of hours
1	Theory part - Basic concepts in finance: financial products, financial institutions and financial markets, etc. - The efficient market hypothesis - Types of financial investment - Financial market in Vietnam	21 hours (incl Mid-term test/ group work)
2	Interest rates and cash flow	6 hours

	- Index numbers and inflation - Simple and compound interest and discount - NPV, IRR - Annuity - Investment appraisal	
3	Bonds and related matters - Some common interest rates - Coupon and no-coupon bond pricing - Determine the spot interest rate and forward interest rate - Movement of bond prices by yield, Macaulay duration	9 hours
4	Forward and future contracts - Forward and future contracts - Futures valuation of assets without income, assets with income, stock indices, foreign currencies, commodities. - Value of forward (future) contracts	3 hours
5	Swaps - Interest rate swap - Value of interest rate swap - Currency swap - Value of currency swap	3 hours
6	Preparation for the final exam	3 hours
Total		45 hours

(Italic text): Self reading.

Textbook, references and softwares

Textbook and references

STT	Title	Author	Publishing year	Main book/references
1.	Options, Futures, and Other Derivative (10th. ed)	John C. Hull (Toronto, Canada)	2017	Main book, chapter 1-7

2	Lecture notes	Le Thi Thanh An et Al.	2022	Important reference
3	Mathematics for Economics and Business	Ian Jacques	2018	Reference
4	Introduction to Financial Mathematic	Nguyen Tien Dung and Do Duc Thai	2014	Reference
5	Lectures on Financial Mathematics	Harald Lang (KTH, Sweden)	2012	Reference

Software: Microsoft Excel

Course Learning Outcomes

On successful completion of this course, students should be able to:

No.	Course Learning Outcomes (CLOs)	Level Capacity*	Program Learning Outcomes
CLO 1	Knowledge		
	CLO 1.1. Understanding common concepts on the financial markets, such as interest, discounting, net present value, internal rate of return, cash flow, annuity, investment appraisal, etc.	2	PLO2
	CLO 1.2. Understanding and know how to use common products on the financial markets, such as forward contracts, futures, options, swaps.	3	PLO2
	CLO 1.2. Understand how the price of some financial products (such as debt securities) fluctuate with interest rate changes.	3	PLO2
CLO 2	Skills		
	CLO 2.1. Compute relevant interest, discounting, net present values, internal rate of return, annuity, investment appraisal, etc.	3	PLO3
	CLO 2.2. Estimate the theoretical price of bonds, spot rate (zero rate), forward rate; calculate Macaulay duration of the bond portfolio; approximate the relative change in bond prices through duration and convexity; can apply them in cash flow matching and immunization.	4	PLO3
	CLO 2.3. Calculate forward and future prices; evaluate the value of forward and future contracts.	5	PLO3
	CLO 2.4. Establish some interest rate swaps, currency swaps and evaluate their values.	5	PLO3
	CLO 2.5. Using Excel to compute/estimate relevant prices and contract evaluation.	3	PLO4
	CLO 2.6. Write and present a report regarding financial products and financial market, for example, building some reasonable customized investment strategies.	4	PLO8

CLO 3	Attitudes		
	CLO3.1. Improve confidence, public presentations skills, group-working skills.	3	PLO7

(*) Bloom standard.

Planning learning activities and teaching methods

No. of teaching hours	Lecturer activities	Student activities	Materials	Notes
6	a. Introduction b. Key terms in the financial market: Exchange-traded markets; Over-the-counter markets; Forward & Futures contracts; Options; Types of traders; Margin, etc. c. Connect to update real – life situations d. Give open questions for group discussion in between topics e. Give the group assignments	Listening, taking notes, answering questions on class Group Discussion Group formulation to do homework (study or search for material, make slides and present on class)	Chapter 1, 2 Textbook, Website given by lecturer and beyond	
6	a. Hedging using future b. Interest and debt securities c. Connect to update real – life situations d. Give open questions for group discussion in between topics	Listening, taking notes, answering questions on class Group Discussion	Chapter 3, 4 Textbook, Website given by lecturer and beyond	
6	a. Forward and future prices; Interest rate futures b. Swaps and evaluation of swaps c. Connect to update real – life situations d. Give open questions for group discussion in between topics	Listening, taking notes, answering questions on class Group Discussion	Chapter 5, 6, 7 Textbook, Website given by lecturer and beyond	
3	a. Let all groups present group assignments b. Comment on each presentation c. Give questions, take the answer and send feedback.	Delivering the presentation; Answering questions on class; (Group discussion required)	Prepared group sides; All relevant documents and websites	
6	a. Introduction, warming quiz b. Details in interest rates and cash flow: Index numbers and inflation; Simple and compound interest and discount; NPV, IRR; Annuity; Investment appraisal. c. Give practical examples and solutions d. Give questions/ exercises in between topics e. Ask questions and give chapter homework	Doing the related quiz; Listening, taking notes, answering questions on class; Group discussion when required	Lecture notes, Chapter 3 Ian Jacques's reference book	

9	a. Warming quiz b. Details in bond and bond pricing; spot rate, forward rate, Macaulay duration, convexity and related applications. c. Give practical examples and solutions d. Give questions/ exercises in between topics e. Show cases in Excel and practice using it for related problems. f. Ask questions and give chapter homework.	Doing the related quiz; Listening, taking notes, answering questions on class; Group discussion when required	Lecture notes, Chapter 4 Textbook	
6	a. Warming quiz b. Details in forward and future prices; value of the forward and future contracts; swaps and swap valuation. c. Give practical examples and solutions d. Give questions/ exercises in between topics e. Show cases in Excel and practice using it for related problems. f. Ask questions and give chapter homework	Doing the related quiz; Listening, taking notes, answering questions on class; Group discussion when required	Lecture notes. Chapter 5, 7 Textbook and relevant websites.	
3	Review over the course	Doing review questions	Lecture notes. Chapter 1- 7 Textbook.	

Course assessment

- Progress (including attending classes and completing all assignments, tests, active studying/contribution in class): 30%.
- Midterm exam (teamwork, presentation): 20%
- Final exam: 50% (format: multiple choices + short answers + essays)

HCMC, January 02, 2022

DEAN OF FACULTY   **HEAD OF DEPARTMENT**   **LECTURER**

Pham Hoang Uyen   Le Thi Thanh An   Le Thi Thanh An