COURSE UNIT DESCRIPTION

Course unit title	Code
Discrete Time Financial Models	

Lecturer(s)	Department, Faculty
Coordinating: assoc. prof. Martynas Manstavičius	Department of Mathematical Analysis Faculty of Mathematics and Informatics

Study cycle	Type of the course unit
First	Compulsory

Mode of delivery	Semester or period when it is delivered	Language of instruction
Face-to-face	7th semester (autumn)	Lithuanian

Requisites	
Prerequisites: Linear Algebra, Probability theory	**Co-requisites (if relevant):**

Number of ECTS credits allocated	Student's workload (total)	Contact hours	Individual work
5	125	48	77

Purpose of the course unit: programme competences to be developed
The aim is to develop stochastic modelling skills in discrete time, ability to recognise arbitrage opportunities in one or several period models, distinguish complete and incomplete market models, price financial instruments traded. Fundamental concepts and results of mathematical finance will be analysed. The course fosters abstract and analytical thinking (2.2), problem solving skills (4.1), ability to apply fundamental mathematical knowledge and demonstrate mathematical reasoning when solving problems in financial mathematics (5.1, 5.2, 5.3) as well as develops knowledge of markets, financial instruments, valuation of their price and risks involved (7.1, 7.3, 7.4, 7.5)

Learning outcomes of the course unit	Teaching and learning methods	Assessment methods
Knowledge and ability to explain the risk neutral pricing principle of financial claims and ability to state and explain at least one form of the first fundamental theorem of asset pricing	Traditional lectures, demonstrations, case studies, group discussions	testing, presentation, practical assignments
Ability to construct hedging strategies and price financial claims in simple discrete time financial models		
Ability to explain the passage to the limit in the CRR model leading to Black-Scholes formulas		
Ability to demonstrate analytical thinking and proper usage of concepts, principles and conventions of financial mathematics when solving practical problems		

Course content: breakdown of the topics	Contact hours							Individual work: time and assignments	
	Lectures	Tutorials	Seminars	Workshops	Laboratory work	Internship/work	Contact hours, total	Individual work	Assignments
1. Financial markets and traded assets. Diversity of financial instruments	1						1	1	Read and learn [2, Chap. II], solve problems at the end of the chapter; individually study suggested literature
2. One period model of a financial market	7	1					8	12	Read and learn [1, I.1-3], solve problems at the end of the chapter; individually study suggested literature
3. Valuation of financial claims. Complete and incomplete markets	2	1					3	5	Read and learn [1, I.4-5], solve problems at the end of the chapter; individually study suggested literature
4. Risk and return	3						3	5	Read and learn [1, I.6], solve problems at the end of the chapter; individually study suggested literature
5. First midterm test	3						3	5	Review literature and problem solutions. Prepare for the test
6. Multiple period model of a financial market	2	1					3	5	Read and learn [1, III.1-2], solve problems at the end of the chapter; individually study suggested literature
7. Martingales and arbitrage-free market	8	1					9	12	Read and learn [1,III.3-4], solve problems at the end of the chapter; individually study suggested literature
8. Binomial (CRR) model	7	2					9	12	Read and learn [1, III.5, IV.1-2], solve problems at the end of the chapter; individually study suggested literature
9. Second midterm test	3						3	5	Review literature and problem solutions; prepare for the test
10. American options	4	2					6	9	Read and learn [1, IV.3-4], solve problems at the end of the chapter; individually study suggested literature
11. Final exam								8	Review theory and problem solutions; Prepare for the exam
Total	**40**	**8**					**48**	**77**	

Assessment strategy	Weight %	Deadline	Assessment criteria
2 midterm tests Each 3 hour test contains closed-book theoretical part	50 (25 each)	During the semester after	Each question and practical problem is given several points for correct computations and mathematically precise explanations of the steps completed. Later points are

and open-book practical assignment. The first test is from topics I through IV while the second is from topics VI through VIII.		relevant material is covered	converted to a 10 grade scale. 10 is awarded for 90-100% of points collected, 9 is given for 80-89% of points collected, etc.
Exam 2 hour long written exam covers topics I-IV, VI-VIII and X. As both tests, it contains a closed-book theoretical part and an open-book practical assignment	50	During exam period	The grading scheme is the same as that on the tests.

Author	Publishing year	Title	Issue of a periodical or volume of a publication; pages	Publishing house or internet site
Required reading				
1. S.R. Pliska	1997	Introduction to Mathematical Finance: Discrete Time Models		Oxford, Blackwell Publishers Inc.
Recommended reading				
2. H. Föllmer, A. Schied	2004	Stochastic finance: an introduction in discrete time	2nd edition	Walter de Gruyter, Berlin New York