COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
Derivatives	

Academic staff	Core academic unit(s)
Coordinator(s): Nora Marija Laurinaitytė **Other(s):**	Faculty of Economics and Business Administration

Study cycle	Type of the course unit
First (Bachelor's)	Elective

Mode of delivery	Semester or period when it is delivered	Language of instruction
Face-to-face	Semester 5	English

Requisites	
Prerequisites: Mathematical Methods, Statistical Theory, Finance I and Finance II	**Co-requisites (if relevant):** none

Number of ECTS credits allocated	Student's workload (total)	Contact hours	Individual work
5	130	36	94

Purpose of the course unit
The purpose of this course on financial markets is introducing students to derivatives pricing, a sub field of asset pricing, discussed in discrete time with introduction to continuous time.

Learning outcomes of the course unit	Teaching methods	Assessment methods
Price options, forwards and futures using discrete-time models. (1.2)	Lectures and lecture notes, tutorials, practical class	Final exam (70%) Group take-home assignment (30%)
Use the Black-Scholes model to understand its empirical shortcomings, and to use alternatives to it. (3.1)	Lectures and lecture notes, tutorials	
Understanding the mathematical foundations of continuous-time finance (3.2)	Lectures and lecture notes, tutorials, reading academic articles, group take-home assignment	
Work as an integral part of a team, while making individual suggestions and developing communication skills. (4.1)	Group take-home assignment	

Content	Lectures	Tutorials	Seminars	Workshops	Laboratory work	Internship	Contact hours, total	Individual work	Tasks for individual work
1. One-period models	2	1					3	8	Hull, Ch. 13
2. Binomial model	1	1					2	6	Hull, Ch. 13
3. Black-Scholes model	2	2					4	10	Hull, Ch. 15
4. "Greeks" and hedging	2						2	5	Hull, Ch. 19
5. Implied volatility, smiles, and skew	2	1					3	8	Hull, Ch. 20
6. Alternatives to the Black-Scholes model	2						2	5	Hull, Ch. 27
7. Interest rate derivatives	2	1					3	8	Hull, Ch. 6+29
8. Valuing defaultable securities	2	1					3	8	Hull, Ch. 24+25
9. Introduction to continuous time models	4	2					6	15	Hull, Ch. 14
10. Monte Carlo simulation and variance-reduction methods	2	1					3	8	Hull, Ch. 21; Glasserman, Ch. 4
11. Exotic options	1	1					2	5	Hull, Ch. 26
12. Pricing of forwards and futures	2	1					3	8	Hull, Ch. 2+5
Total	24	12					36	94	

Assessment strategy	Weight %	Deadline	Assessment criteria
Group take-home assignment	30	One day before the final exam	Group take-home assignment, given out around Easter, which asks a group of 2-3 students to write codes in R (Matlab or Octave can alternatively be used as well) in order to price derivatives and to use them in order to obtain results, which are to be interpreted. It needs to be handed in by e-mail until 11:59 pm on the day before the final exam.

Final exam (90 minutes)	70	Final exam period	Written exam held in the exam period. A collection of exercises that require calculations, derivations, or concise answers.
			The final exam and the take-home assignment shall be assessed in the following way:
			- over 95%, or excellent: 10;
			- over 85%, or very good: 9;
			- over 75%, or good: 8;
			- over 65%, or fair: 7;
			- over 55%, or satisfactory: 6;
			- over 50%, or poor: 5.
			Under 50%, or unsatisfactory: 4, 3, 2, 1.

Author (-s)	Publishing year	Title	Issue no. or volume	Publishing house or web link
Required reading				
Lecture notes and slides as well as online resources will be made available to all students.				
John C. Hull	2017	Options, Futures and Other Derivatives	10th edition	Pearson Prentice Hall
The R Project for Statistical Computing	2017	An Introduction to R	Version 3.4.2	https://cran.r-project.org/doc/manuals/ r-release/R-intro.pdf
Recommended reading (text books)				
Zvi Bodie; Alex Kane; Alan J. Marcus	2010	Investments	9th edition	McGraw-Hill
Paul Glasserman	2003	Monte Carlo Methods in Financial Engineering	1st edition	Springer
Steven E. Shreve	2004	Stochastic Calculus for Finance I: The Binomial Asset Pricing Model	1st edition	Springer
Steven E. Shreve	2004	Stochastic Calculus for Finance II: Continuous-Time Models	1st edition	Springer
Recommended reading (articles)				
Black, Fischer; Scholes, Myron	1973	The Pricing of Options and Corporate Liabilities	Vol. 81, No.3, pp. 637-654	The Journal of Political Economy
Heston, Steven L.	1993	A Closed-Form Solution for Options with Stochastic Volatility with Applications to Bond and Currency Options	Vol. 6, No.2, pp. 327-343	Review of Financial Studies
Merton, Robert C.	1976	Option Pricing when Underlying Stock Returns are Discontinuous	Vol. 3, pp. 125-144	Journal of Financial Economics
Bakshi, Gurdip; Cao, Charles; Chen, Zhiwu	1997	Empirical Performance of Alternative Option Pricing Models	Vol. 52, No. 5, pp. 20032049	Journal of Finance