COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
Mathematics of Modern Finance	

Lecturer(s)	Department(s) where the course unit (module) is delivered
Coordinator: A.Kregždė **Other(s):**	Institute of Applied Mathematics Faculty of Mathematics and Informatics

Study cycle	Type of the course unit (module)
Second	Alternative

Mode of delivery	Period when the course unit (module) is delivered	Language(s) of instruction
Face-to-face (Distance)	**Spring (2 semester)**	English

Requirements for students	
Prerequisites: Calculus. Probability theory, Mathematical statistics	**Additional requirements (if any):** Approximation, Stochastic analysis

Course (module) volume in credits	Total student's workload	Contact hours	Self-study hours
6 credits	156	32	124

Purpose of the course unit (module): programme competences to be developed		
The purpose of the course is to develop ability of the students to apply mathematical methods to evaluate financial instruments, financial risk and return.		
Learning outcomes of the course unit (module)	**Teaching and learning methods**	**Assessment methods**
Will be able to understand financial markets and financial instruments as well as to apply mathematical techniques to priced financial instruments, their returns and portfolio.	Lectures, solving practical problems, self-study	Exam
Will be able to use options and other derivatives to build investment strategies and manage financial risk.	Lectures, solving practical problems, self-study	Exam
Will be able to apply methods of financial risk management and solve practical problems arising in financial markets	Lectures, solving practical problems, self-study	Exam
Will be able to use various teaching strategies and methods s	Lectures, solving practical problems, self-study	Exam

Content: breakdown of the topics	Contact hours	Self-study work: time and assignments

	Lectures	Tutorials	Seminars	Exercises	Laboratory work	Internship/work	**Contact hours**	**Self-study hours**	**Assignments**
1. Interest rates. Annuities. Yield rate.	2						**2**	**5**	Reading and analysis of textbooks. Solving practical problems
2. Capital markets and financial instruments. Pricing of securities. Duration and convexity.	2			0			**2**	**10**	Reading and analysis of textbooks. Solving practical problems
3.Monte-Carlo simulation. Markov's process. Modeling of returns. Modeling of returns.	4						**4**	**10**	Reading and analysis of textbooks. Solving practical problems
4. Derivatives. Forward, Futures, Swaps. Pricing of derivatives.	4						**4**	**10**	Reading and analysis of textbooks. Solving practical problems
5.Options. meaning of options and their applications. The relationship between call and put options. Methods of evaluations of options. Hedging with the options. Strategies of trading of options, Financial engineering using options. Black- Sholes model.	6						**6**	**15**	Reading and analysis of textbooks. Solving practical problems
6. Fix income instruments. Derivatives of fixed income instruments.	2						**2**	**8**	Reading and analysis of textbooks. Solving practical problems
7. Stocks markets. Indices.	2						**4**	**6**	Reading and analysis of textbooks. Solving practical problems
8.Financial risk Market risk. Linear and non-linear risk. Value at risk(VaR). Parametric and non-parametric VaR. Modelling of VaR	6						**4**	**10**	Reading and analysis of textbooks. Solving practical problems
9. Credit risk. Measurement of risk. Actuarial and market prices methods. Credit VaR. Measurement of credit risk.	4						**4**	**10**	Reading and analysis of textbooks. Solving practical problems
10. Elements of probability theory. Functions of random variables. Elements of mathematical statistics. Derivative of the function and their application	0							**10**	Reading and analysis of textbooks. Solving practical problems
11. Case studies.	0							**30**	Reading and analysis of textbooks. Solving practical problems
Total	**32**						**32**	**124**	

Assessment strategy	**Weight,%**	**Deadline**	**Assessment criteria**
Presentation of case study	40%	During the semester	Presentation of case study orally an in written form..

Exam	60%	During the session	Maximum number of points - 60.

Author	Year of publication	Title	Issue of a periodical or volume ore publication	Publishing place and house or web link
Compulsary reading				
Philippe Jorion	2010	Financial Risk Manager Handbook	Wiley	
Robert Steiner	2011	Mastering Financial Calculation	FT PITMAN PUBLISHING,	
John C. Hull,	2019	Risk Management and Financial Institutions,	Prentice Hall	
Optional reading				
Philippe Jorion	2007	Value at risk	McGraw Hill	
Jean-Philippe Bouchaud, Marc Potters,	2009	Theory of financial risk and derivative pricing : from statistical physics to risk management	Cambridge University Press	
Connel Fullenkamp	2018	Crashes and Crises. Lessons from History of Financial Disasters	The Teaching Company, Virginia, USA	
Iñaki Aldasoro, Jon Frost, Leonardo Gambacorta and David Whyte	2021	Covid-19 and cyber risk in the financial sector,	BIS Bulletin No 37, January 2021.	
John C. Hull,	2021	Options, futures and other derivatives	Prentice Hall	