Description of study programme

Title of the study programme	State code of the study programme
Financial and Actuarial Mathematics	**612G17001**

Official name of awarding institution	Language (s) of instruction
Vilnius University, Faculty of Mathematics and Informatics	**Lithuanian**

Kind of study	Study cycle	Level of qualification under the Lithuanian Qualification Framework
University studies	first	sixth

Mode of studies; Length of the study programme (in years)	Study programme volume in credits	Total student's workload (in hours)	Contact hours	Self-study hours
Full-time (4)	240	6400	**≥3118**	**≤3282**

Study area	Study field	Branch of study field
Physical Sciences	Mathematics	Financial and Actuarial Mathematics

Qualification degree/Professional qualification awarded
Bachelor in Financial and Actuarial Mathematics

Chair of the study programme committee	Contact information
Dr. Martynas Manstavičius	**martynas.manstavicius@mif.vu.lt**

Accrediting body	Period of accreditation
Centre for Quality Assessment in Higher Education	2018-07-01

Aim of the study programme
Preparation of professionals who have fundamental background in pure mathematics and information technologies, together with detailed understanding of demographical, economical, insurance, financial risks, and are able to apply theoretical knowledge to solve practical problems. Program graduates are capable of thinking abstractly, logically and critically, operating in various professional environments, and demonstrating necessary skills to pursue academic careers.

Content of the study programme: course unit groups	Distinctive features of the study programme
Years One and Two of the programme cover **fundamental mathematical principles and techniques** needed to understand and use financial and actuarial models later on. **Core mathematics subjects** (60 credits) include *Mathematical Analysis, Algebra and Geometry, Discrete Mathematics, Probability Theory and Mathematical Statistics*, as well as *Differential and Integral Equations*. Substantial attention during these two years is given also **to practical and finance-related subjects** in: *Informatics* (20 credits), *Micro/Macro Economics* (10 credits), and *Foreign language* (10 credits). The remaining 20 credits are split between introductory courses into *Financial and Actuarial Mathematics*	• Program syllabus is in line (covers 75–80% of required skills and competences) with the requirements of Lithuanian Society of Actuaries and International Actuarial Association • Program strives to achieve a balance between pure mathematics, applications of mathematics in finance (including insurance) and management of (financial) risks as well as informatics. • Students are acquainted with the principles of scientific research; the brightest ones have multiple opportunities to participate in the

(10 credits) and optional courses (10 credits) which furnish supplementary tools, **techniques and broader knowledge and modelling skills** *in Informatics, Economics, Statistics* and even provide an introduction to academic careers. **Year Three and the Autumn** semester of Year Four **focus on abstract, sophisticated mathematics** (Finite Population Statistics, Functional Analysis, Random Processes, Time Series; 20 credits) and **its applications** – using probability and statistics to solve real world problems in insurance and finance (45 credits). Application-focussed courses include *Survival and Demographic Models, Regression Models, Investment Theory, Basics of Investment, Non-Life Insurance Models, Financial Risk Management, Actuarial Mathematics, Discrete-Time Financial Models, and Health Insurance.* Optional courses to broaden knowledge in a variety of fields amount to 20 credits during these three semesters. The remaining 5 credits are devoted to fostering scientific writing and research skills which are required in the final semester. The final, **Spring semester of Year Four** includes an 11 week-long *Internship* (15 credits) and *Graduation Thesis* (15 credits). Among the above mentioned optional courses, 15 credits (out of 30) are devoted to General University Studies and amount to choosing 3 subjects from a special university-wide list of courses and are freely chosen by a student.	research activities of the faculty (seminars, joint papers, etc.).

Admission requirements	Recognition of prior learning
At least secondary education. Entrance score is formed from the grades of following subjects: Mathematics, Lithuanian Language and Literature, Information Technology or Physics, and one more subject different from those already included.	

Access to further studies
Bachelors of Financial and Actuarial Mathematics can continue their studies at the Master's level in Mathematics, Statistics or Economics.

Employability
Programme graduates are expected to be successfully employed as actuaries, financial analysts, consultants in the financial/insurance sector and in public administration, namely, in insurance companies, pension/investment funds, health care and social security organizations, general financial and risk management institutions, etc.

Teaching and Learning methods	Assessment methods
Case study, problem-based learning, modelling, discussion, presentations, individual and group projects	Oral and written quizzes, tests, exams, oral presentations, term papers, portfolios, graduation thesis

Generic competencies		Expected learning outcomes Program graduate	
1.	**Communication and team working skills**	**1.1**	Will be able to effectively present information, ideas, problems and solutions to peers, managers and clients
		1.2	Will be able to work in an interdisciplinary environment
2.	**Abstract / logical thinking**	**2.1**	Will be able to demonstrate abstract and logical thinking in various environments
		2.2	Will be able to critically evaluate obtained results and their implications
3.	**Life-long learning skills**	**3.1**	Will be able to organize individual learning and work, manage time and resources – select appropriate objectives, methods and tools

		3.2	Will be able to individually analyse study literature, critically reflect on the need for a higher level of knowledge and personal improvement
		3.3	Will be socially responsible. Will be able to understand importance of academic and professional standards
4.	**Research fundamentals**	**4.1**	Will be able to demonstrate skills in problem solving, logical argument, deductive reasoning and analysis, abstraction and generalisation
		4.2	Will be able to locate, retrieve, synthesise, and use information from a variety of different sources; to present results of research to the audience of peers.
Subject-specific competencies		**Expected learning outcomes** **Program graduate**	
5.	**Fundamental knowledge and skills in pure mathematics**	**5.1**	Will be able to demonstrate understanding of the main mathematical fields (Mathematical Analysis, Linear Algebra, Geometry, etc.) and to apply this knowledge when solving problems
		5.2	Will be able to demonstrate mathematical reasoning by critically following and presenting mathematical arguments, proofs, appropriately using various mathematical propositions, etc.
		5.3	Will be able to demonstrate proper usage of mathematical formalism by showing understanding of mathematical language and role of symbols, to read and write mathematical text
		5.4	Will be able to construct proofs of new simple propositions, related to known results
6.	**IT knowledge and application skills**	**6.1**	Will be able to demonstrate understanding of basic IT concepts and apply this knowledge in practice
		6.2	Will be able to use specialized software (e.g., R, Matlab, Latex, etc.) in practice
		6.3	Will be able to write simple codes in a programming language (e.g., C, VB.NET, SQL, etc.)
7.	**Applications in Financial / Actuarial field**	**7.1**	Will be able to demonstrate understanding of the core principles of financial and insurance business, including (but not limited to) main laws of micro/macroeconomics; socio-economic and demographic environment, etc.
		7.2	Will be able to practically explain relationships between different socio-economic/demographic variables and their importance
		7.3	Will be able to demonstrate broad understanding of fundamental financial/actuarial principles, models, methods and to choose appropriate software when solving basic unknown problems
		7.4	Will be able to critically evaluate problem under investigation from data and assumptions to results and appropriate conclusions
		7.5	Will be able to recognize financial risks, critically evaluate associated losses and apply basic risk management methods

STUDY PLAN (full-time studies)
(COMPETENCES AND LEARNING OUTCOMES ACROSS COURSE UNITS (MODULES))

Code	Course units (modules) according to types	Volume in credits	Total student workload	Contact hours	Individual work	Competences of the study programme																				
						Generic competences									Subject-specific competences											
						1.		2.		3.			4.		5.				6.			7.				
						Learning outcomes																				
						1.1	1.2	2.1	2.2	3.1	3.2	3.3	4.1	4.2	5.1	5.2	5.3	5.4	6.1	6.2	6.3	7.1	7.2	7.3	7.4	7.5
Programme totals		**240**	**6400**	**≥2655**	**≤3745**																					
YEAR 1		**60**	**1600**	**801**	**799**																					
SEMESTER I		**30**	**800**	**401**	**399**																					
Compulsory course units (modules)		**30**	**800**	**401**	**399**																					
	Mathematical Analysis I	10	268	127	141	X		X	X	X	X		X		X	X	X									
	Algebra and Geometry	5	144	82	62	X		X		X	X		X		X	X	X									
	Discrete Mathematics	5	138	74	64	X		X	X	X	X		X		X	X	X									
	Introduction to Financial and Actuarial Mathematics	5	125	52	73		X			X	X	X										X		X		
	Informatics I	5	125	66	59	X				X	X			X					X	X	X					
SEMESTER II		**30**	**800**	**400**	**400**																					
Compulsory course units (modules)		**30**	**800**	**400**	**400**																					
	Mathematical Analysis II	10	268	128	140	X		X	X	X	X		X		X	X	X			X						
	Algebra	5	142	76	66	X		X		X	X		X		X	X	X									
	Financial mathematics	5	140	66	74	X	X		X				X	X								X	X	X	X	
	Informatics II	5	125	66	59	X				X	X			X	X	X	X									
	Foreign Language I	5	125	64	61	X	X			X	X			X												
YEAR 2		**60**	**1600**	**≥805**	**≤ 795**																					
SEMESTER III		**30**	**800**	**431**	**369**																					
Compulsory course units (modules)		**30**	**800**	**431**	**369**																					
	Mathematical Analysis III	5	150	93	57	X		X	X	X	X		X		X	X	X			X						

	Microeconomics	5	137	72	65		X			X		X		X		X						X	X			
	Practical Informatics I	5	130	68	62	X				X									X	X	X					
	Probability Theory and Mathematical Statistics	10	254	134	120			X	X	X	X		X	X	X	X	X		X	X						
	Foreign Language II	5	129	64	65	X	X			X	X			X												
SEMESTER IV		**30**	**800**	**≥374**	**≤426**																					
Compulsory course units (modules)		**20**	**550**	**278**	**272**																					
	Statistics	5	140	60	80	X			X	X	X		X	X	X	X	X		X	X					X	
	Macroeconomics	5	150	80	70		X			X		X		X		X						X	X			
	Practical Informatics II	5	126	64	62	X				X									X	X	X					
	Differential and Integral Equations	5	134	74	60	X		X		X	X		X		X	X	X			X						
Optional course units (modules)		**10**	**250**																							
One course unit from the following list:		**5**	**125**																							
	Database Management Systems	5	125	70	55	X		X	X	X	X		X	X					X		X					
	Modern Economic Thought	5	125	69	56		X	X	X	X	X		X	X	X							X	X			
	Statistical Modelling	5	125	64	61			X	X	X	X			X	X	X			X	X	X					
	Statistical Decision Theory	5	125	64	61			X	X		X		X	X	X	X	X	X	X	X						
	Financial Reports and their Analysis	5	125	63	62			X	X		X		X	X					X			X	X	X	X	X
	Game Theory	5	125	48	77			X	X	X			X				X					X	X	X	X	
	Visual Programming	5	125	52	73				X		X			X					X		X			X		
	Scientific Seminar I	5	125	32	93	X		X			X		X	X		X	X	X	X	X	X			X	X	
	Physics	5	125	64	61		X	X	X		X		X	X	X	X	X									
GUS subject[1]		**5**	**125**	≥48	≤77																					
YEAR 3		**60**	**1600**																							
SEMESTER V		**30**	**800**	**≥744**	**≤856**																					
Compulsory course units (modules)		**30**	**800**	**388**	**412**																					

[1]General University Studies. Developed competences depend on the subject chosen by a student.

	Finite Population Statistics	5	125	55	70				X			X		X	X	X	X		X	X			X			
	Survival and Demographic Models	5	140	77	63	X				X			X	X								X	X	X	X	
	Functional Analysis	5	143	77	66			X	X		X		X	X	X	X	X	X								
	Regression Models	5	133	63	70								X	X	X	X	X		X	X			X	X	X	
	Investment Theory	5	133	66	67				X		X	X		X	X	X			X	X	X	X	X	X	X	X
	Basics of Investment	5	126	50	76				X		X	X		X					X	X		X		X	X	X
SEMESTER VI		**30**	**800**	**≥346**	**≤454**																					
Compulsory subjects		**20**	**550**	**250**	**300**																					
	Random Processes	5	150	84	66			X	X		X		X	X	X	X	X							X		
	Non-Life Insurance Models	5	142	56	86			X	X	X			X	X	X	X	X					X		X	X	X
	Financial Risk Management	5	128	50	78	X			X	X	X	X		X	X	X						X	X	X	X	X
	Actuarial Mathematics	5	130	60	70				X				X	X	X	X	X	X		X		X	X	X	X	X
Optional course units (modules)		**10**	**250**																							
One course unit from the following list:		**5**	**125**																							
	Database Management Systems	5	125	70	55	X		X	X	X	X		X	X					X		X					
	Modern Economic Thought	5	125	69	56		X	X	X	X	X		X	X	X							X	X			
	Statistical Modelling	5	125	64	61			X	X	X	X			X	X	X			X	X	X					
	Statistical Decision Theory	5	125	64	61			X	X		X		X	X	X	X	X	X	X	X						
	Financial Reports and their Analysis	5	125	63	62			X	X		X		X	X					X			X	X	X	X	X
	Game Theory	5	125	48	77			X	X	X			X				X					X	X	X	X	
	Visual Programming	5	125	52	73				X		X			X					X		X			X		
	Scientific Seminar I	5	125	32	93	X		X			X		X	X		X	X	X	X	X	X			X	X	
	Physics	5	125	64	61		X	X	X		X		X	X	X	X	X									
GUS subject		5	125	≥48	≤77																					
YEAR 4		**60**	**1600**	**≥363**	**≤1237**																					
SEMESTER VII		**30**	**800**	**≥348**	**≤452**																					
Compulsory course units (modules)		**20**	**550**	**252**	**298**																					

	Time Series	5	138	52	86				X	X			X	X	X	X	X			X			X	X	X	
	Discrete-time Financial Models	5	140	66	74				X				X		X	X	X					X		X	X	X
	Health Insurance	5	130	66	64	X				X		X		X								X	X	X	X	X
	Foundations of Scientific Research	5	142	68	74	X				X	X	X		X			X		X	X						
Optional course units (modules)		**10**	**250**																							
	Queuing Theory	5	125	53	72		X		X	X	X		X		X				X	X	X			X	X	
	Scientific Seminar II	5	125	32	93			X	X		X		X	X	X	X	X	X	X	X	X				X	
	Sources of Economic Data and Their Processing	5	125	48	77	X			X					X					X	X	X		X			
	Mathematical Economics	5	125	90	35				X				X	X	X	X	X					X	X		X	
	Public Sector Economics	5	125	52	73	X			X	X	X	X		X								X	X		X	
	JAVA Technologies	5	125	70	55	X			X	X	X	X	X	X					X		X					
GUS subject		5	125	≥48	≤77																					
SEMESTER VIII		**30**	**800**	**15**	**785**																					
Compulsory course units (modules)		**30**	**800**	**15**	**785**																					
	Graduation Thesis	15	399	10	389	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Internship	15	401	5	396	X	X	X	X	X	X	X	X	X					X	X	X	X	X	X	X	X