



VILNIUS UNIVERSITY

**STUDY FIELD: MATHEMATICS  
SECOND-CYCLE STUDY PROGRAMME  
FINANCIAL AND ACTUARIAL MATHEMATICS  
CODE: 621G17001  
SELF-EVALUATION REPORT**

Prorector of Vilnius University

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Vilnius  
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### Key data on the study programme

Title	Financial and Actuarial Mathematics
Code	621G17001
Study area	Physical Sciences
Study field	Mathematics
Kind of study	University studies
Language of instruction	Lithuanian, English
Study cycle	Second-cycle
Mode of study and length in years	Full-time, 1.5 years
Scope in credits	90
Qualification awarded	Master in Financial and Actuarial Mathematics
Date of registration and Order No	25 May 2011, Order No. 1-01-62

Abbreviations used in the Self-Evaluation Report:

VU – Vilnius University

FAM – Financial and Actuarial Mathematics

SP – Study programme

SPC – Study programme committee

SER – Self-evaluation report

## Composition of the self-evaluation group (SEG)\* and their responsibilities

Name, surname, contact information	Position	Area and scope of responsibility in SEG
Vigirdas Mackevičius	Professor	Head of SEG, chairman of the SPC, Chapters 1,2,5
Jonas Šiaulyš	Professor, Head of the Department of Mathematical Analysis	Communication with programme graduates; comments of data, Chapter 6
Remigijus Leipus	Professor	Partial preparation of the report
Donata Puplinskaitė	Lecturer, PhD	Responsible for collection of data, Chapters 3,4
Rokas Gylys	Chairman of Lithuanian Actuarial Society	Communication with social partners
Edgaras Urbanavičius	A students' representative	Communication with programme students

\*Approved by the Dean of the Faculty (Order No. D-40, 20 October 2016).

### Schedule of task implementation

Task	Date of implementation
Collecting all relevant information for the self-evaluation	2016-11-12
First draft of the text of the Self-evaluation Report (SER)	2016-11-26
Discussing the first draft of SER focusing on three areas of evaluation: purpose and learning outcomes, curriculum design and academic staff	2016-12-03
Discussing the first draft of SER focusing on three areas of evaluation: facilities and teaching/learning resources, study process and assessment of academic progress, study programme (SP) management	2016-12-23
Presentation of the SER to the teaching staff, social partners of the SP, discussing their feedback	2017-01-20
Final draft of SER	2017-01-30

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## INTRODUCTION

Vilnius University (hereinafter also University or VU), founded in 1579, is the oldest and largest institution of higher education in Lithuania. The University management structure is defined in the *Statute of Vilnius University* (approved 6 May 2014 by Law of the Republic of Lithuania No XII-862), which stipulates that the University community shall exercise its self-governance through the bodies of governance of the University: *the Senate, the Council and the Rector*. As of 1 October 2016, the University had 3662 employees (including 1370 teaching staff and 444 research staff) and had 20864 students. The University comprises 23 core academic units: twelve faculties, seven institutes (with two of them of faculty status), four research and study centers and seven core non-academic units.

The University implements study programmes of three study cycles in the areas of the humanities, social, physical, biomedical and technological sciences; the total number of undergraduate (bachelor) study programmes is over 70, the number of (graduate) master and integrated study programmes exceeds 110. Doctoral students may enroll in almost 30 and residents in more than 50 study programmes.

The Faculty of Mathematics and Informatics (hereinafter also Faculty) was founded as The Faculty of Mathematics and Mechanics in 1965. In 1971, at the Department of Applied Mathematics a new study program has been started, Informatics, although at that time it was called Science of Calculating Machines or Science of Computing. In 1998, the Faculty of Mathematics and Mechanics was renamed into the Faculty of Mathematics and Informatics. The Faculty operates in accordance with the Statute of Vilnius University. The Faculty is headed by the Faculty Council and the Dean. Presently, the Faculty comprises 10 departments (*Computer Science I, Computer Science II, Didactics of Mathematics and Informatics, Differential Equations and Numerical Mathematics, Econometric Analysis, Mathematical Analysis, Mathematical Computer Science, Mathematical Statistics, Probability Theory and Number Theory, Software Engineering*) and 3 centers (*Digital Science and Computing Centre, Information Technology Research Centre, Mobile Application Laboratory*). They are engaged in research and studies. The main research areas of the Faculty include Fundamental and Applied Mathematics, Informatics and Information Technologies. There are 2 journals published by the Faculty - "Proceedings of the Lithuanian Mathematical Society, Series A" and "Nonlinear Analysis: Modelling and Control". The research results are disseminated in national and international conferences.

The Faculty implements 8 first-cycle (*Bioinformatics, Information Technologies, Informatics, Software Engineering, Mathematics and Applications of Mathematics, Econometrics, Financial and Actuarial Mathematics, Statistics*) and 8 second-cycle (*Computer Modeling, Informatics, Software Engineering, Mathematics, Modern Didactics of Mathematics, Econometrics, Financial and Actuarial Mathematics, Statistics*) study programmes. The Faculty also implements doctoral studies in the fields of Mathematics and Informatics.

Presently, the Faculty has 208 staff members (teaching, research and administrative), including 28 professors and chief research fellows, 38 associate professors and senior research fellows, 45 lecturers with a PhD, 56 lecturers, assistant lecturers and 2 junior research fellows, 39 administrative staff. There are 2174 students in the Faculty (2016 10 01) – 1821 at bachelor level, 287 at master level, 37 doctoral students, 29 others.

The study programme of *Actuarial and Financial Mathematics* is implemented by the Department of Mathematical Analysis. The programme has been implemented for 8 years (the first Master students enrolled into the programme on 1 September 2008, and the first class graduated in January 2010). During 2012–2013, up to 20% of the Master level programme was renewed while implementing the project EFDR "The renewal of the study programmes in Econometrics and Financial and Actuarial Mathematics and their adaptation to the needs of the international labor market" financed by the Ministry of Education and Science of the Republic of Lithuania and the European Social Fund. The programme was adapted to comply with the Bologna process guidelines, ECTS credit system was adopted, although the layout of the programme remained essentially the same. The changes were

approved by the Faculty Council (12 Dec. 2012, protocol No. 5) and Vilnius University Senate Board (10 Jan. 2013, no. SK-2013-1-8).

The Programme went through external assessment in 2010. *The overall assessment of the programme was positive and accredited for 6 years.* The Assessment Report and the changes induced thereof are discussed below in appropriate sections.

## ANALYSIS OF THE STUDY PROGRAMME

### 1. Purpose and learning outcomes of the study programme

#### 1.1. Purpose and learning outcomes of the study programme. Learning outcomes across course units (modules)

The purpose of the study programme: high-profile education in financial and actuarial mathematics with an emphasis on theoretical foundation of various methods and techniques of probability theory, stochastic analysis, risk theory, and related fields. Graduates of the programme are qualified to analyze and solve problems in theoretical models of finance and insurance, with implementation of obtained solutions in practice.

The competences and learning outcomes of the study programme (hereinafter also SP) are as follows:

**Table 1.1.1 Generic and subject-specific competences and learning outcomes of the SP**

Study programme generic competences developed		Study programme learning outcomes. The students will:	
1.	<b>Abstract and critical thinking.</b>	1.1	Be able to use mathematical language in the proofs of new statements.
	2.	1.2	Dispose of enhanced analytical, critical, and conceptual problem solving and decision making capabilities and skills
3.	<b>Work in a team and individually.</b>	2.1	Be able to work independently and in a team both as a leader and/or as a team member.
4.	<b>Carrying on research work.</b>	3.1	Be able to analyze, systemize, and evaluate data necessary for research, professional activity, innovation, and problem solving.
	5.	3.2	Be able to apply new research results and appropriate methods for analyzing and solving problems or situations.
	6.	3.3	Be able to adequately present research results to specialists and nonspecialists.
Study programme subject specific competences developed.		Study programme learning outcomes. The students will:	
4.	<b>Advanced theoretical knowledge in financial and actuarial mathematics.</b>	4.1	Be equipped with fundamental and conceptual knowledge of the mathematical aspects of financial theory and insurance techniques.
		4.2	Have advanced insights in the actuarial aspects of life insurance, general insurance, and risk theory and in the interrelationship and integration of financial and actuarial mathematics.
5.	<b>Ability to apply mathematical knowledge and skills to analyzing and solving actuarial problems.</b>	5.1	Be able to apply the methods and models of actuarial mathematics to real-life problems.
	1.	5.2	Be able to understand the benefits and limitations of modeling and analyze realistic examples.
		5.3	Be able to stay up-to-date with the advances in actuarial sciences by following up and familiarizing with new insights, developments, results, and methods.
6.	<b>Ability to apply mathematical knowledge and skills to analyzing and investigating financial instruments and markets.</b>	6.1	Be able to model financial instruments and financial markets.
	2.	6.2	Be able to use stochastic analysis theory to analyze financial markets.

	3.	6.3	Have a strong background in financial models and be able to select and apply those methods to problems that involve risk and uncertainty.
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Upon completion of the Master SP of FAM, a student may engage in further studies at the doctoral level in mathematics and/or statistics or work in the insurance companies, banks, pension and investment funds, consulting firms, government agencies, etc. (e.g., as actuaries, financial analysts, risk assessors, consultants both for Lithuanian and foreign institutions supervising financial and insurance markets).

A qualification obtained upon the completion of the second-cycle study programme is in conformity with qualification VII as specified in the Qualifications Framework of the Republic of Lithuania.

## 1.2. Availability of information about the purpose and learning outcomes of the SP

Information on the purpose, learning outcomes, content of the SP and admission requirements is accessible on the internet to all prospective students, academic community and the society at large. The information is freely accessible at:

- In the catalogue of study programmes of Vilnius University on its official website<sup>1</sup>;
- On the official website of the Faculty<sup>2</sup>;
- On the official website of the University intended to prospective students<sup>3</sup>.
- On the official website of the *Open System of Providing Information, Tutoring and Vocational Orientation*, or AIKOS (a Lithuanian acronym)<sup>4</sup>

Every year, the University issues a special publication intended for the dissemination of information about second-cycle study programmes *Kviečia Vilniaus universitetas. Antroji pakopa*. (Vilnius University is calling. Second study cycle).<sup>5</sup> The publication is available during a variety of promotional events, also on the internet, where all interested in studying in Vilnius University can easily access it, etc.

Every year the SP, its purpose/s and learning outcomes are introduced at the following promotional events:

- Vilnius University *Discovery Days*, when the administration, the teaching staff and the students of the Faculty of Mathematics and Informatics deal with study-related issues on an individual basis.
- Study Fair *Mokymasis, studijos, karjera* (Learning, Studies and Career) held at LITEXPO, where all information related to the studies in the SP is given by the administration, the teaching staff and the students of the Faculty of Mathematics and Informatics.
- During Vilnius University visits to secondary schools, where study programmes of all levels are introduced.
- Some course units (modules) are accessible to school students when they come to Vilnius University in autumn and spring during an event called *A student for a single day*. At that time, school students have an opportunity to attend lectures held at the Faculty of Mathematics and Informatics together with the University students.<sup>6</sup>

## 1.3. Information about the revision of learning outcomes and participation of social partners in the SP implementation

<sup>1</sup> <http://www.vu.lt/studijos/apie-studijas/studiju-programos/magistranturos-studijos/>

<sup>2</sup> <http://mif.vu.lt/lt3/studijos/studiju-programos/ma-studiju-programos/finansu-ir-draudimo-matematika/>

<sup>3</sup> <http://www.vu.lt/kviecia/>

<sup>4</sup> <https://www.aikos.smm.lt/studijuoti/SitePages/Noriu%20studijuoti.aspx?ss=807adefe-19bb-42dc-8f25-a9e3acdfbe34>

<sup>5</sup> <http://www.vu.lt/kviecia/rinkis-studijas/priemimas/2-pakopos-studijos>

<sup>6</sup> <http://www.vu.lt/kviecia/aplankyk/studentas-vienai-dienai>

The learning outcomes were revised twice: in 2012–2013, during the above-mentioned project EFDRA, and in 2015–2016, by the renewed programme committee in view of market tendencies, feedback from students, graduates, social partners, and recommendations of Department of Quality Control of Study Programmes of VU. In particular, the elements of teamwork have been implemented in the courses (for example, students were asked to study material in groups and then to give a presentation of the group work to other students and teacher).

Each semester, at least two meetings of the SPC take place. The SPC contains a social partner G. Bakštys, Senior Actuary of ERGO Life Insurance. The SP is also discussed at informal meetings on Tuesdays before the weekly seminars of FAM.

#### **1.4. Conformity of learning outcomes to the requirements specified in international and domestic documents focusing on academic and professional standards**

Generic and subject-specific competences and learning outcomes were formulated taking into account the concept of Mathematics and the description of knowledge and abilities necessary for Mathematics according to *Description of Study Cycles*, Order No. V-2212, 21 November 2011, of the Minister of Education and Science<sup>7</sup> and *Confirmation of the Description of Study Programme in Mathematics* approved by Order No V-813, 23 July 2015, of the Minister of Education and Science.<sup>8</sup>

FAM programme is adjusted to the requirements of the Lithuanian Actuarial Society (LAS) and Actuarial Association of Europe (AAE, former Groupe Consultatif Actuariel Européen). Note that Lithuanian Actuarial Society is a member of AAE. The representatives of LAS in AAE are Evaldas Valeiša, Dr. Eugenija Bieliauskienė (graduate of FAM programme), and Rokas Gylys (doctoral student of prof. J. Šiaulys). Also, the courses and contents of SP are adjusted to the exams of the Institute and Faculty of Actuaries (IFA, see <https://www.actuaries.org.uk>): Probability and Mathematical Statistics, CT4 Models, CT5 Contingencies, CT6 Statistical Methods, CT8 Financial Economics. Note that FAM Bachelor programme is also adjusted to the exams at IFA: CT1 Financial Mathematics, CT2 Finance and Financial Reporting, CT7 Business Economics. Therefore, after successful completion of the FAM programme, MSc in FAM is essentially acquainted with the majority of exams at IFA.

#### **1.5. The SP in the context of other study programmes implemented by VU and other universities**

Actually, there are no overlapping or competing Master programmes in Lithuania. Certain (rather weak) links can be found with the Master programmes “Finance and Banking” offered by Vytautas Magnus University in Kaunas (Master in Finance) and “Financial Engineering” offered by Vilnius Gediminas Technical University (VGTU). Perhaps the main difference is that our program is focused on a strong theoretical (mathematical) basis and elements of research. This, of course, does not mean that our graduates may have difficulties in practice. Rather the opposite: a good knowledge of theoretical models provides a deeper and more complete understanding of real financial processes, allowing them to effectively address practical problems. Another important difference between our programme and programmes mentioned above is that our program introduces students to the mathematical models applied not only in finance but also in insurance.

#### **1.6. Strengths and weaknesses of the area under evaluation and improvement measures to be taken**

##### Strengths:

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<sup>7</sup> <https://www.e-tar.lt/portal/lt/legalAct/TAR.7FAF374025FF>

<sup>8</sup> <https://www.e-tar.lt/portal/lt/legalAct/96ceca70311f11e5b1be8e104a145478>

- The programme is the only one in Lithuania providing Master studies with strong emphasis on advanced theoretical knowledge towards applications to Financial and Actuarial Mathematics.
- Employers appreciate specialists with advanced mathematical knowledge and skills.
- Study programme develops skills that are highly desirable in the current jobs market. According to various sources (e.g., careercast.com, linkedin.com) the demand for math-skilled specialists is high and will increase in future.
- The students can continue their studies at the doctoral level in mathematics (actuarial and financial mathematics, theory of random processes, probability theory and mathematical statistics).
- The employment of the graduates practically is 100%. Financial and insurance institutions readily admit our students even before graduation.
- After completing of the FAM programme, the graduates are prepared for the majority of exams at the Institute and Faculty of Actuaries.

Weaknesses:

- The three-semester programmes seem to be more attractive than four-semester ones; however, the former have more limitations for effective studies.

Improvement measures:

- To allow the students to choose additional courses, up to 10 credits for free (for more credits to be paid).

## 2. Curriculum design

### 2.1. Study plan, conformity of curriculum design with the provisions of legal acts

Anyone considering the Master degree in financial and actuarial mathematics firstly should have strong mathematical and analytical thinking skills. Students should also possess business sense, creative thinking, good computer skills, and be well informed with current financial and economic trends.

The curriculum of masters programs related to finance and insurance can be rather various. Most of our students are graduates of bachelor programmes in financial and actuarial mathematics or related programmes. The majority of our students are employees of financial and insurance companies. So they possess good business sense, strong computer skills. This is why our program is focused on the deep knowledge of mathematics and mathematical models describing financial and insurance business. Analytical and critical thinking is the main aim of our programme.

The curriculum design of the currently implemented study programme of Financial and Actuarial Mathematics is in conformity with the *General Requirements for Master Study Programmes* approved by Order No V-826 of 3 June 2010 by the Minister of Education and Science, the *Regulation of Study Programmes of Vilnius University* approved by Decree No SK-2012-12-4 21 June 2012 by Vilnius University Senate Commission, and a description of the study field of Mathematics approved by Order No V-813 of 23 July 2015 by the Minister of Education and Science of the Republic of Lithuania.

**Table 2.1.1. The conformity of the Master SP of FAM to the general requirements of the second-cycle study programmes**

Requirements	In the study programme
The scope of the second cycle study programme shall be between 90 and 120 credits.	90 credits
The total number of course units per semester shall be no more than 5.	5 units in 1 <sup>st</sup> and 2 <sup>nd</sup> semesters
A student's individual work shall make no less than 30% of each course unit.	>50%



Course units within the study field shall make at least 60 credits; their content shall be of higher quality level than corresponding first-cycle course units within the same study field.	60 credits; it is
Optional course units offered by the university are intended for specialized studies and shall make no more than 30 credits.	Yes, they are; 10 credits
The scope of the graduation thesis shall be at least 30 credits.	30 credits

Table 2.1.2. STUDY PLAN (COMPETENCES AND LEARNING OUTCOMES ACROSS COURSE UNITS)

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.		
						Learning outcomes												
						1.1	1.2	2.1	3.1	3.2	3.3	4.1	4.2	5.1	5.2	5.3	6.1	6.2
<b>YEAR 1</b>		<b>60</b>	<b>1600</b>	<b>650</b>	<b>950</b>													
<b>SEMESTER I</b>		<b>30</b>	<b>800</b>	<b>324</b>	<b>476</b>													
<b>Compulsory course units (modules)</b>		<b>30</b>	<b>800</b>	<b>324</b>	<b>476</b>													
	Selected chapters of analysis	6	160	66	94	x	x	x		x								
	Probability theory and mathematical statistics	7	190	80	110	x	x	x		x	x	x						
	Nonlife insurance	5	138	48	90	x		x	x	x		x	x	x				
	Time series analysis	6	158	64	94	x		x		x	x					x	x	x
	Stochastic analysis	6	154	66	88	x			x	x	x					x	x	
<b>SEMESTER 2</b>		<b>30</b>	<b>800</b>	<b>326</b>	<b>474</b>													
<b>Compulsory course units (modules)</b>		<b>20</b>	<b>574</b>	<b>226</b>	<b>348</b>													
	Life insurance. Health insurance	8	226	96	130			x	x	x	x		x	x	x			
	Financial mathematics	6	174	66	108	x	x			x		x				x		x
	Risk theory	6	174	64	110	x	x	x	x	x	x	x		x	x			
<b>Optional course units (modules)</b>		<b>10</b>	<b>226</b>	<b>100</b>	<b>126</b>													
	Dynamic aspects of survival theory	5	113	50	63	x			x	x	x		x		x			
	Financial Derivatives	5	113	50	63					x						x	x	x
	Stochastic models of financial mathematics	5	113	50	63	x	x			x						x		x
	Risk management	5	113	50	63					x	x	x		x				x
	Pension funds	5	113	50	63			x			x		x	x	x			
<b>YEAR 2</b>		<b>30</b>	<b>800</b>	<b>16</b>	<b>784</b>													
<b>SEMESTER 3</b>		<b>30</b>	<b>800</b>	<b>16</b>	<b>784</b>													
	Master thesis	30	800	16	784	x	x			x	x	x		x				x

## 2.2. Principles of curriculum design and rationale of the SP

The scope of the SP of FAM is 90 credits; the length of the SP is one year and a half (three semesters).

During the first semester, students have opportunity to deepen their mathematical skills and acquire knowledge necessary to build competences in modeling of financial and insurance processes. It contains five compulsory subjects: *Selected Topics of Mathematical Analysis, Probability Theory and Mathematical Statistics, Nonlife Insurance, Time Series Analysis, and Stochastic Analysis*.

During the second semester, the main emphasis is on the so-called core areas of financial and actuarial mathematics. It contains three compulsory subjects: *Life and Health Insurance, Financial Mathematics, and Risk Theory*. So, altogether, there are eight compulsory subjects. Moreover, in the second semester, the students also have to take two optional courses from possible five, in accordance with their interests and future plans. Finally, students are supposed to prepare a Master thesis during the third semester. The programme is flexible via individual plans: students may change courses of equal credits in agreement with the programme director and vice-dean of academics.

During the period of evaluation, the SP has been adjusted twice. According to recommendations of the previous evaluation and to comply with legal acts, in 2011, the number of courses in the first semester was diminished to 5 (or 10 courses per year). In 2016, two optional courses were moved from the third to second semester, thus leaving the third semester totally focused on writing the Master thesis.

It is worth noting that in 2014 several topics and parts of Master programme were included in Bachelor programme of FAM (e.g., Nonlife Insurance). Therefore, at present, there are several overlaps in those programmes. However, there is no any overlap between the current Master programme and the previous Bachelor programme, which is still valid for students who entered the University before 2014. In 2018, the students who will come after graduation of the new Bachelor programme will begin their studies in the new Master programme, in which the following changes will be made:

- *Nonlife Insurance* will be removed (included in the new Bachelor programme);
- *Probability Theory and Mathematical Statistics* will be divided into separate courses, *Probability Theory* and *Mathematical Statistics with R*;
- *Dynamical Aspects of Survival Theory* will be reorganized to *Survival Analysis with SAS* (in fact, prof. V. Bagdonavičius has already included training of the current students with SAS);
- Under initiative of Bank of Lithuania, an optional course on new requirements for financial and insurance institutions (Basel III–IV, Solvency II, etc.) is to be included in the programme.
- All course units will carry multiples of 5 ECTS credits.

## 2.3. Study methods, proportion between contact hours and students' individual work

The SP classwork comprises lectures, practical training, classes, seminars, and presentations. In addition, some extra consultations are provided by many teachers before a variety of exams and tests. The study methods consist of case studies, proofs of various statements, demonstration of examples, discussions, group work, and problem solving. In general, study forms and methods are broadly suitable to achieve intended goals.

Proportion between contact hours and student's individual work is presented in Table 2.3.1. A relatively high proportion of student's individual work hours is motivated, on one hand, by a higher qualification of students after bachelor studies and, on the other hand, by the need of obtaining in-depth knowledge and understanding of models of financial and actuarial mathematics, develop their abilities to use abstract and critical thinking for solution to various problems and decide whether existing methods are applicable. Individual work involves preparation for lectures, seminars, and exams, analysis and solution of problems, individual reading, literature searches, and preparation of the graduation thesis.

**Table 2.3.1. Proportion between contact hours and students' individual work**

Semester	Compulsory course units			Optional course units		
	Contact hours	Individual work, hrs.	Total	Contact hours	Individual work, hrs.	Total

1	324	476	800			
2	226	348	574	100	126	226
3	16	784	800			
<b>Total</b>	<b>566</b>	<b>1608</b>	<b>2174</b>	<b>100</b>	<b>126</b>	<b>226</b>

## 2.4. Requirements for graduation theses

Graduation theses are prepared in accordance with the *Procedure for the Preparation, Defense and Safekeeping of Graduation Theses* approved by Decree No R-446 of Vilnius University Pro-Rector on 17 November 2015. The criteria for assessing graduation theses are also provided in the same Decree. Detailed recommendations and requirements for Master theses are provided in the guidelines prepared and approved by the Department of Mathematical Analysis.<sup>9</sup> These guidelines may be reconsidered at the beginning of each study year. Guidelines are comprehensive and include not only the requirements for the thesis (subject, methodology, presentation, etc.) but also some general advices on selection of a thesis topic and supervisor, preparation for defense, etc. The criteria for assessing graduation theses are also provided in the description of the course unit (module) *Master Thesis*. The Master thesis is intended to demonstrate competences acquired during the master studies. Each student should be able to consider and solve autonomously a mathematical, statistical, or practical problem related to insurance or finance by applying acquired knowledge and skills, select and use the related literature, apply and/or modify mathematical methods, and present the Master thesis in a high-level mathematical language. By working on their graduation theses, the students develop the following skills: Ability to use and apply the scientific methods and technical competences from actuarial and financial mathematics acquired during the master study; Critical interpretation of scientific results and their integration into the respective knowledge; Collection and processing statistical data and application of methods of statistical analysis and data interpretation; Presentation of their results in writing according to the principles of good scientific practice; Compliance with ethical norms and principles: correct citation of all used sources, compliance with data protection rules, etc. There are no any official norms of length of Master thesis. In practice, it varies from 20 to 70 pages.

The theses are supervised by the academic staff of the SP. The list of possible topics is announced on February. The students choose the topic after having discussed them with potential supervisors and approved by the Department of Mathematical Analysis. A student may choose his/her own subject under approval of a supervisor and the department.

The theses are prepared during the third semester and typically must be submitted until 3 of January; then they are distributed for reviewers, who must present a review at least two days before the defense day (typically, 10–15 January).

## 2.5. Internship

There is no internship in the Master SP of FAM. However, most of the students have jobs in financial and insurance companies, which can be interpreted as informal internships.

## 2.6. Strengths and weaknesses of the area under evaluation and improvement measures to be taken

### Strengths:

- The SP courses provide advanced insights into the financial and actuarial mathematics and into the interrelationship and integration of finance and actuarial sciences.
- All subjects of the programme are closely related to probability theory, which is the basis of all financial and actuarial models.
- A large part of individual work encourages students for the self-research skills.
- The structure of the programme is consistent with a corresponding Bachelor programme of Financial and Actuarial Mathematics.

<sup>9</sup> [http://www.mif.vu.lt/katedros/mak/doc/FDM\\_rekomendacijos.pdf](http://www.mif.vu.lt/katedros/mak/doc/FDM_rekomendacijos.pdf)

- The possibility to change some courses of the programme to better meet the individual needs of the students.
- High standards of studies ensure high quality of the master theses. The majority of these works can be published in scientific journals.

Weaknesses:

- Lack of practical courses.
- The majority subjects of the programme are fully theoretical.
- Traditional programmes related to the finance or insurance contain a separate statistical course. The current programme version has only several statistical topics included in the probability theory course.
- The main three nonlife insurance models are considered in two courses, *Nonlife Insurance* and *Risk Theory*. These models have a lot of similar properties, so it is better to deal with them in one course.

Improvement measures:

- To discuss the possibility of inclusion of some practical courses in the programme.
- To include elements of information technology and applied aspects in the courses *Time Series Analysis* and *Nonlife Insurance*.
- Organize a separate *Statistics* course with a broad range of information technologies.
- To merge the *Nonlife Insurance* and *Risk Theory* courses.

### 3. Academic staff

#### 3.1. Composition of academic staff and its conformity to requirements

The study programme of Financial and Actuarial Mathematics is implemented by 9 academic staff members, including 5 full professors, 2 associate professors and 2 lecturers (see Table 3.1.1).

The teaching experience of the above 9 academic staff, whose main employer is Vilnius University, is 28 years on average; their work experience is 32 years on average.

**Table 3.1.1. Composition of academic staff according to academic titles and research degrees and scope of teaching in the SP of FAM**

Academic title, research degree	No of people employed	Scope of teaching in the SP*	
		Credits	Percentage
Professors (Dr. Habil. or Dr.)	5	66-71	73-79%
Associate Professors (Dr.)	2	10-15	11-17%
Lecturers with a doctoral degree	2	4-10	4-11%
<b>Total</b>	<b>9</b>	<b>90</b>	<b>100%</b>

The composition of the academic staff is in conformity to the requirements stipulated in legal acts of the Republic of Lithuania<sup>10</sup>, which is reflected in the following table:

**Table 3.1.2. Conformity of the qualifications of academic and other staff in the second-cycle SP of FAM to the General Requirements and to the Regulation of Study Programmes of Vilnius University**

Requirements	In the study programme
No less than 80% of the academic staff shall have a doctoral degree.	100 %
All staff involved in lecturing (reading theoretical courses) shall have a doctoral degree ( <i>Regulation of Study Programmes of Vilnius University</i> ).	100 %

<sup>10</sup> *General Requirements for Master Study Programmes* approved by Order No V-826 of the Minister of Education and Science 3 June 2010.



<b>Total</b>	0	1	0	0	0	0	0	0	0	0
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The age of the academic staff implementing the SP of FAM is 56 years on average. It is planned to improve this aspect engaging younger teachers.

**Table 3.2.2. Distribution of academic staff by age**

Position	Age				
	25-34	35-44	45-54	55-64	65 and over
Professors	0	0	0	3	2
Associate professors	0	1	0	1	0
Lecturers/doctors	0	0	1	1	0
<b>Total</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>5</b>	<b>2</b>

### 3.3. Teaching workload of academic staff

The annual teaching load of an academic working full-time is 1872 hours on average (36 work hours per week) is shown in Table 3.3.1.

**Table 3.3.1. Teaching workload (average)**

Position	Contact work with students (in class)		Other work (out of class)		Research and experimental development (RED)		Dissemination of information about academic and RED activities		Improving qualifications, managerial and organizational activities		Total	
	hours	%	hours	%	hours	%	hours	%	hours	%	hours	%
Professors	562	30	412	22	749	40	75	4	75	4	1872	100
Associate professors	861	46	599	32	300	16	75	4	37	2	1872	100
Lecturers/doctors	973	52	824	44	75	4	0	0	0	0	1872	100

This table is rather approximate since “out of class” time is not well formalized. VU is in the process to reform the salary system for academic staff. The Faculty of Mathematics and Informatics is on the forefront of this reform and is working on the model to see what impact to the existing system changes in the required teaching load, research, and other work hours would have to all involved. At this time, precise data on the teaching load, and especially other (out of class) work, of academic staff involved in our programme is not available. Contact hours, of course, are listed in course unit descriptions, but these numbers alone would not show a complete picture of staff involvement. We hope that the new faculty-wide (and later possibly university-wide) staff work monitoring system which is currently tried at our Faculty will yield more accessible data and clearer overall picture. As of now, we can only provide *suggested* (or discussed; not yet approved) working hour distribution for each category of academic staff (see Table 3.3.2). From this table, the annual teaching load of an academic staff member working full-time is 300.8 hours on average (1584 work hours per year; 36 work hours per week). Actual data vary depending on the academic staff member since some have higher teaching load and some teach in various programmes; balancing the teaching load to match the envisioned workload is yet to be accomplished.

**Table 3.3.2. Envisioned teaching workload for various academic staff members**

Position	Contact work with students (in class)		Other work (out of class)		Research and experimental development (RED)	
	hours	%	hours	%	hours	%

Professors	224	14.14	836	52.78	524	33.08
Associate professors	256	16.16	804	50.76	524	33.08
Lecturers\doctors	384	24.24	1200	75.76	NR	
Lecturers	384	24.24	1200	75.76	NR	
Assistant professors	256	16.16	804	50.76	524	33.08

NR – not required

### 3.4. Competence and professional development of the academic staff

There are a number of possibilities and measures for the development of the academic staff in the programme. The teachers were involved in the project EFDRA “The renewal of the study programmes in Econometrics and Financial and Actuarial Mathematics and their adaptation to the needs of the international labor market,” where they were introduced to some new methodologies and possibilities of teaching, presentation of material, etc. The scientific competence is mainly developed by the research activity, participation in seminars, conferences, expertise, societies, etc. Professional development is mainly due to joint work with social partners from finance and insurance business, participation in the projects, etc.

The scope of research undertaken by the SP academic staff is shown in Table 3.4.1.

**Table 3.4.1. Research output of the academic staff of the SP in 2012-2016**

	01	02	03	04	05	06	07	08	09	Total
<b>2012</b>	0	3	19	0	19	1	2	0	0	<b>44</b>
<b>2013</b>	0	3	18	0	26	0	4	0	0	<b>51</b>
<b>2014</b>	1	1	10	0	29	0	8	0	0	<b>49</b>
<b>2015</b>	5	5	18	0	20	0	3	0	0	<b>51</b>
<b>2016</b>	4	5	6	0	16	0	6	0	0	<b>37</b>
<b>Total</b>	<b>10</b>	<b>17</b>	<b>71</b>	<b>0</b>	<b>110</b>	<b>1</b>	<b>23</b>	<b>0</b>	<b>0</b>	<b>232</b>
<b>01</b>	<b>BOOKS:</b> (1) Monographs (monograph, study); (2) Literature intended for studies (textbook, teaching aid, other study-related literature); (3) reference publications (dictionary, guidebook, manual, encyclopedia, atlases, maps, others); (4) other books (publications on the sources of research and scientific heritage, comments of legal acts, reports of projects, and other works, compiled and/or edited work, chapters in books)									
<b>02</b>	<b>SUMMARIES</b> ((1) summary of a doctoral dissertation, (2) summary of a habilitation thesis, (3) an overview of research papers submitted for the habilitation procedure)									
<b>03</b>	<b>ARTICLES IN SERIAL PUBLICATIONS (JOURNALS) AND SINGLE VOLUMES</b> ((1) article in DB Thomson Reuters <i>Web of Science</i> , (2) article in DB Thomson Reuters <i>Web of Science</i> , (3) article in the international DB and publishing houses, (4) article in other peer-reviewed publications, (5) popular science article, (6) article in a publication on research, arts or culture, (7) other articles (overviews, information, introductory)									
<b>04</b>	<b>PUBLICATIONS OF RESEARCH SOURCES AND PUBLICATION OF SCIENTIFIC HERITAGE</b>									
<b>05</b>	<b>REVIEWS</b> ((1) review in DB Thomson Reuters <i>Web of Science</i> , (2) review in DB Thomson Reuters <i>Web of Science</i> , (3) review refereed in the international databases and publishing houses, (4) review refereed in other databases, review in other peer-reviewed publications, (5) review in a science popular publication, (6) review in a publication on research, arts or culture)									
<b>06</b>	<b>ARTICLES IN CONFERENCE PROCEEDINGS:</b> (1) Articles in peer-reviewed conference proceedings (article in DB Thomson Reuters <i>Web of Science</i> , article in conference proceedings in the international DB and (or) in the international publishing house, article in conference proceedings refereed in other databases, article in peer-reviewed international conference proceedings abroad, article in peer-reviewed international conference proceedings in Lithuania, article in peer-reviewed conference proceedings in Lithuania); (2) Articles in non-reviewed conference proceedings (article in non-reviewed international conference proceedings abroad, article in non-reviewed international conference proceedings)									
<b>07</b>	<b>CONFERENCE ABSTRACTS:</b> (1) Conference abstracts in peer-reviewed publications (abstracts in DB Thomson Reuters <i>Web of Science</i> and abstracts in Thomson Reuters Master Journal List, abstracts in other databases, peer-reviewed extended abstracts, abstracts in other peer-reviewed publications); (2) Conference abstracts in non-reviewed publications									
<b>08</b>	<b>PATENTS</b> ((1) patents registered in the European Patent Office (EPO), (2) patents registered in the US Patent and Trademark Office (USPTO), (3) patents registered in the Japan Patent Office (JPO), (4) patents registered in other countries, (5) patents registered in Lithuania, (6) other patents)									
<b>09</b>	<b>TRANSLATION</b> ((1) translated book, (2) chapter in a book, (3) article)									



**Table 3.4.2 Research projects implemented by the SP academic staff in 2012-2016**

Title of project	Period	Source of funding/Partner(s)
<b>International projects</b>		
Virtual library of resources from Health insurance area.	2014 – 2015	Health insurance section at International Actuarial Association
Investigation of pension adequacy metrics (measures) throughout the world.	2015 – ongoing	Social Security Committee at International Actuarial Association
<b>National projects</b>		
Modelling of long memory and heavy tails in finance and insurance, No. MIP-036/2011	2011 – 2012	Research Council of Lithuania
The renewal of the study programmes in Econometrics and Financial and Actuarial Mathematics and their adaptation to the needs of the international labor market No. VP1-2.2-ŠMM-07-K-02-008.	2011 – 2013	EU Social Fund
Concrete functional analysis and probability theory: new methods and their applications No. MIP-53/2012/LSS-580000-456.	2012 – 2014	Research Council of Lithuania
Nonlinear long memory, heavy tails and aggregation, No. MIP-063/2013	2013 – 2015	Research Council of Lithuania

### 3.5. Exchange of academic staff

The teachers of the programme made a number of visits to other research centers and universities, where participated in various seminars, conferences and meetings. During 2012–2016, prof. R. Leipus visited Mälardalen, Copenhagen, Aarhus, Nantes, Nanjing Audit, and Soochow Universities; prof. J. Šiaulyš visited Nanjing Audit, Soochow, Tartu, and Kiev Universities; prof. V. Paulauskas visited Georgia Institute of Technology, Lille, St. Petersburg, M. Kopernicus, Warsaw, and Aarhus Universities, conferences in Madrid, Zurich, Barselona, and Eilat (Israel); assoc. prof. M. Manstavičius visited Mälardalen, Vroclav, Dortmund Technical, Vienna, and Zalcburg Universities. Dr. A. Skučaitė, a representative of Lithuanian Society of Actuaries, actively participates in the work of Social Security Committee and Health Committee of International Actuarial Association. During the meeting in Zürich in 2015, she presented a talk about Social Security system in Lithuania, and currently (since 2016) she is engaged in IAA project Stability and Adequacy of Social Security Pensions throughout the World.

The visiting lecturers from abroad are listed in the following table.

**Table 3.5.1. Invited academic staff from abroad in the study programme in 2012-2016**

Year	Name of lecturer	Institution (country)
2012	A. Malyarenko	Malardalen University (Sweden)
2013	Y. Davydov	Université des Sciences et Technologies de Lille (France)
2014	A.Malyarenko	Malardalen University (Sweden)
2014	Y. Mishura	Kiev University (Ukraine)
2015	R. Kangro	Tartu University (Estonia)

### 3.6. Proportion of academic staff to students in the study programme

**Table 3.6.1. Proportion of academic staff to students admitted to the SP according to year of admission**

Year of admission	Number of academic staff	Plan	Proportion of number of academic staff / nlan	Number of candidates	Proportion academic staff/ number of	Admitted students	Proportion academic staff/ admitted students
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		Students (sf and nsf)*		Students (sf and nsf)		Students (sf and nsf)	
2012	9	16	0,56	18	0,50	13	0.69
2013	9	28	0,32	23	0,39	12	0.75
2014	9	16	0,56	45	0,20	16	0.56
2015	9	16	0,56	22	0,41	12	0.75
2016	9	14	0,64	35	0,26	21	0.43
<b>Average: 18</b>				<b>Average: 29</b>		<b>Average: 15</b>	<b>Average: 0.6</b>

\*sf—funded by the state; nsf—not funded by the state

**Table 3.6.1. Proportion of academic staff to all students in SP**

<b>Year 2016</b>	Number of academic staff	Number of students*	Proportion students/ academic staff
<b>Financial and Actuarial Mathematics</b>	9	35	<b>3,89</b>
Informatics	21	42	2,00
Computer Modeling	12	81	6,75
Software Engineering	17	61	3,59
Mathematics	14	16	1,14
Econometrics	10	39	3,90
Statistics	8	5	0,63

\* Including those who temporarily stopped their studies or are in academic vacation.

It is rather difficult to comment and evaluate these proportions because, in fact, all the teachers involved in the SP are also involved in other SPs, mainly in the Bachelor SP of FAM, where the proportion academic staff, students is 8.5. The SPC thinks that both proportions are appropriate for studies of FAM. For example, in average, each teacher is a supervisor of two students writing the master thesis, which seems to be optimal.

### **3.7. Strengths and weaknesses of the area under evaluation and improvement measures to be taken**

#### Strengths:

- The teachers of the programme have a high academic and scientific qualification, large practical experience, necessary for teaching financial and actuarial mathematics.
- The teachers of SP are experts in their fields. Their scientific works are welcome in the prestigious scientific journals.

#### Weaknesses:

- The possibilities of mobility are not sufficiently covered.
- The possibilities for professional development could be better.
- There is lack of human resources. Many teachers of the programme are overloaded by their lectures.
- Reduction of teaching load in order to improve teaching quality.
- There is lack of financial resources for the teacher salaries. In fact, the level of the teacher salary is two-three times lower than the employee salary having a similar complexity position in a business company. Thus, it is difficult to attract highly qualified faculty.

#### Improvement measures:

- Reduction of teaching workload in order to improve teaching quality.
- Promotion of more active participation in international exchanges of teachers by allocating more resources. It is planned to join the project (NordPlus) on the exchange of teachers and students with the Mälardalen University, Riga Technical University, and Tartu University, having similar programmes.

- Teachers' salary is formed according to the same principles throughout the University. Currently, the reform is being prepared for the teacher salaries. We hope that provisions of the reform will be favorable for teachers of all programmes, including ours.
- Seven doctoral students are studying in the department at the moment. All subjects of their studies are closely related to financial or insurance models. We hope that some of these students will join the team of teachers in the future.

#### 4. Facilities and learning resources

##### 4.1. Rooms available for studies and the number of workplaces

The Faculty of Mathematics and Informatics (FMI) is situated in two locations in Vilnius: two buildings are next to each other at Naugarduko St. 24 and Šaltinių St. 1A, and another building is located at Didlaukio St. 47. Both places of the Faculty are reachable by public transport. The lectures of Financial and Actuarial Mathematics study programme take place mainly in two buildings: Naugarduko St. 24 and Šaltinių St. 1A. In addition to that, students have optional courses at the Didlaukio St. Building, and general university courses (GUS) at the other university facilities, depending on their choice. The most frequently used rooms and laboratories for the study programme are presented in Tables 4.1.2 and 4.1.3.

**Table 4.1.2. Rooms most frequently employed for studies**

Room No (or name)	Address	Area, m <sup>2</sup>	Number of workplaces	Equipment available in the room
N101	Naugarduko St. 24	204,10	224	Projector, sound system, computer for presentations, blackboard
N102		135,10	140	Projector, sound system, computer for presentations, blackboard
N103		133,80	124	Projector, sound system, computer for presentations, blackboard
N105		32,40	25	Projector, computer for presentations, blackboard
N113		32,54	25	Projector, computer for presentations, blackboard
N203		53,36	40	Blackboard
N300		48,87	45	Projector, blackboard
N301		69,60	80	Projector, blackboard
N303		67,07	80	Projector, blackboard
N304		34,14	25	Projector, blackboard
N306		32,90	25	Blackboard
N309		32,90	25	Blackboard
N311		34,80	25	Blackboard
N312		34,80	25	Projector, blackboard
N409		33,40	25	Blackboard
N411		34,10	25	Blackboard

N415		35,30	25	Blackboard
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The average occupation of class rooms in autumn semester is 76%, in spring - 51%.

**Table 4.1.3. Teaching and learning laboratories most frequently employed for studies**

Room No (or name)	Address	Area, m2	Number of workplaces	Equipment available in the room
S07	Šaltinių St. 1A	41,65	16	8 Windows computers, blackboard
S10		30,90	16	8 Terminal computers, blackboard
S11		35,40	16	8 Terminal computers, blackboard
S12		35,40	16	8 Terminal computers, blackboard
S13		82,60	40	20 Terminal computers, projector, blackboard
S14		29,98	13	13 Terminal computers, projector, computer for presentations, blackboard
Video conference room		172,52	40	8 Terminal computers, projector, sound system, computer for presentations, blackboard

Students of Financial and Actuarial Mathematics study programme work about 74 of all contact hours in computer laboratories. This is 10.4% of all 712 contact hours. Students have to use various software in the following subjects: Time Series Analysis, Life-Insurance, Health-Insurance, and Pension Funds.

The average occupation of laboratories in autumn semester is 37%, in spring - 30%. The number of rooms and computer laboratories are sufficient for successful study. Greater part of students is using available computers at the laboratories, others are using their own laptops. During the last 5 years, the building at Didlaukio St. was renovated and 8 new computer classes were installed. Therefore, computer laboratories at Šaltinių St. 1A became less crowded. This step gives the possibility to create more effective and convenient academic timetable for the students of Financial and Insurance Mathematics.

There is a library reading room in Naugarduko St. with 90 seats (8 of them with computers). Opening hours of the library are 9:00-18:00. The occupation of the library varies during the study year: in July and August, it is approximately 5%, in September it reaches 70%, in December and May (before examination session) it rises up to 95%, and during the remaining time it ranges between 30-70%.

Students can also use the resources and self-study environment at the new modern Vilnius University library (MKIC) located at Saulėtekio St. 5, which was opened in 2013.

There are also lounge rooms in Naugarduko St. and Didlaukio St. buildings, where students usually study, relax or use self-service cafeteria.

The ground floors of the Faculty buildings at Naugarduko St. and Šaltinių St. are accessible for disabled students. When planning the timetable, all lectures for study programmes with disabled students are being planned at the first floor so these students could have an easy access to the rooms. Three largest rooms in Didlaukio St. building are equipped with remote controlled cameras for online broadcasting of lectures for disabled students.

The following Table 4.1.4 represents the renovation of rooms at Naugarduko St. 24 facilities in 2015-2016.

**Table 4.1.4. Renovation of rooms and laboratories for teaching and learning**

No	Room for teaching and learning	The works completed and their cost during 2015-2016, EUR
1.	N107	Renewal of the room, 1875 EUR
2.	N113	Renewal of the room, 2120 EUR

In the earlier years this kind of renovation was also carried out, but no detailed records can be found. There are no major investments planned for renovation of Naugarduko St. 24 and Šaltinių St. 1A facilities, because a new building for the Faculty will be constructed in the near future at Visoriai, since there is already a funding of 32 million EUR planned for this matter.

## 4.2. Equipment for studies

Usually rooms with blackboards and projectors are used for theory lectures. Some lecturers have their own laptops to connect to the projector, otherwise, they can use laptops kept at the security office. Lecturers use either rooms with blackboards and projectors at Naugarduko St. 24 or computer laboratories at Šaltinių St. 1A during practice classes. There are 156 workplaces with computers in this building. When laboratories are not used for practice classes, students can use them for self-study. The larger rooms are also equipped with microphones.

The laboratories enable students to work on different operating systems (Linux, Windows, iOS). Students can use various software, statistical-econometric packages like SAS, Eviews, R, and SPSS.

High speed and wireless internet connection is available in all Faculty buildings. Students and staff of the university can use Eduroam or MIF open wireless connection. Every student of the Faculty of Mathematics and Informatics gets additional electronic resources: every student receives 500 MB of space on servers for study purposes and can create, and set up his or her own websites. Students and academic staff can also use the supercomputer located at the Faculty of Mathematics and Informatics for scientific research purposes or educational activities free of charge. It is especially powerful computer designed to handle large amounts of information and to conduct scientific calculations more rapidly.

Vilnius University Centre of Information Technology Development provides various core IT services for staff and students (e-mail, e-mail conferences, web page hosting, etc.). Vilnius University E-learning and Examination Centre provides Virtual Learning Environment for lecturers and enables examination of large groups of students simultaneously in large computer classes in Saulėtekio St. buildings.

The available software and computer equipment meets teaching and learning needs. Each year the Faculty assigns budget for equipment renewal. Detailed information is provided in the following Table 4.2.1.

**Table 4.2.1. Budget for equipment renewal**

Year	Hardware (Computers, multimedia, servers), EUR	Software (servers and workplaces), EUR
2012	87975	87558
2013	255499	268573
2014	342547	48118
2015	51119	5311
2016	38261	3594

In 2013 there was an increase of budget for computer classes' renovation in Didlaukio St. 47; most of the money for this renovation was gathered from the project EINFRA. There was a new Apple computers class "Innovation Space" established in 2014, which was financed by social partner - Barclays. There was also a lot of new server equipment and software purchased in 2014. Every year Faculty dedicates constant amount of money for hardware and software upgrading in classes and for supercomputer.

## 4.3. Teaching and learning resources

The Faculty library owns around 70000 various resources and publications (books, journals, textbooks) on mathematics, statistics, probability theory, economics, informatics, information technologies, and other subjects in different languages (mostly in English and Lithuanian).

The mathematical and statistical literature constitutes the majority of the library holdings. The Faculty library cooperates with the Central Vilnius University library and the Lithuanian library of the Science Academy. Funds are regularly renewed.

The resources of the Faculty library are constantly updated according to the plan of the Central library of the University and teachers' requests. Usually, teachers send their requests to the library staff. Books or journals are ordered after the list of requested resources is approved by the vice-dean for financial matters. Each year the amount spent on Faculty library resources renewal is about 14000 EUR. Detailed information about the budget for journals and books at the Faculty is provided in Table 4.3.1.

**Table 4.3.1. Budget for journals and books, EUR**

2012	2013	2014	2015	2016
16398,20	15667,34	16726,31	11295,01	10007,49

The budget for purchasing books and journals has decreased in 2015, because students started using electronic resources more often, for example, electronic books, and publications in databases. Students can find relevant information in electronic databases (via Vilnius University library): Springer Link, Science Direct, JSTOR, Annual Reviews, etc. Vilnius University Library is subscribed to more than 60 databases. Students can also find lecture notes and study material of the subjects on lecturers' webpages and in virtual learning environment.

#### **4.4. Strengths and weaknesses of the area under evaluation and improvement measures to be taken**

##### Strengths:

- Material resources are sufficient for the successful implementation of the study programme. Premises are sufficient, and their quality is appropriate.
- The Faculty is currently partially adapted for people with disabilities, their needs are prioritized when conducting a timetable.
- Learning resources (software, books in the library, etc.) are constantly updated according to the needs of lecturers and students.

##### Weaknesses:

- There is a need to increase budget for new versions of software, as well as some additional software needed for successful studies.

##### Improvement measures:

- A new building for the Faculty is being planned, so the premises' quality will be improved significantly in the near future.
- The Faculty will continue consistently invest in new books, better software and hardware.

## **5. Study process and assessment**

### **5.1. Admission requirements, statistics and major tendencies**

Candidates to the SP of Financial and Insurance Mathematics are admitted in accordance with the *Rules of Admission to the Second-cycle Study Programmes of Vilnius University*, approved by the VU Senate. The Rules are accessible on the VU website<sup>11</sup>. A prerequisite for admission is the completion of the first-cycle studies in financial and/or actuarial mathematics or related fields. The entrance score is calculated according to a formula, by adding up the mean value of the marks enumerated in the Diploma Supplement and a mark

<sup>11</sup> See <http://www.vu.lt/kviecia/rinkis-studijas/kaip-istoti/2-pakopos-studijos>

for the graduation thesis or marks for the final examinations. During the period of self-evaluation, the principles of calculating the entrance score have not been modified.

**Table 5.1.1. Entrance scores of the candidates admitted to the SP of Financial and Insurance Mathematics during the period of self-evaluation**

Year of admission	No of students funded by the state (sf) / not funded by the state (nsf)	Entrance score of the students admitted to the study programme of Financial and Insurance Mathematics			Mean value of the entrance score of all Faculty programmes
		Highest score	Lowest score	Mean value	
2012	sf 13	23,36	16,32	19,84	19,13
	nsf 0	-	-	-	-
2013	sf 11	22,45	15,60	19,03	18,62
	nsf 1	-	-	-	14,39
2014	sf 16	22,37	15,51	18,94	18,26
	nsf 0	-	-	-	-
2015	Sf 11	22,97	18,60	20,79	18,72
	nsf 1	-	-	-	-
2016	sf 21	19,60	16,08	17,84	17,86
	nsf 1	-	-	-	-

All the students admitted to the SP of FAM, except one ERASMUS student and one student from China, during the analyzed period were funded by the state. On the other hand, the entrance score of the students admitted to the SP of FAM was decreasing, except in 2015, when the man value of the entrance score was the highest during the period. However, the mean value of the SP of FAM was higher than the mean value of the Faculty programmes during the analyzed period, except the last year. This fact shows the popularity of the programme between strong students.

There is no clear trend of the entrance score of the FAM programme. The mean value behavior trajectory is similar to a typical trajectory of an ARMA process.

**Table 5.1.2. Results of candidate admission to the SP of Financial and Insurance Mathematics during the period of self-evaluation**

Year of admission	Number of students funded by the state (sf) / not funded by the state (nsf)	Planned number of students	Number of applications		Regular competition*	Number of admitted students	Admitted students (% of planned number)
			1 <sup>st</sup> priority	Total			
2012	sf	13	14	17	1,31	13	100%
	nsf	3	0	1	0,33	0	0%
	<b>Total</b>	<b>16</b>	<b>14</b>	<b>18</b>		<b>13</b>	<b>81%</b>
2013	sf	13	13	19	1,46	11	85%
	nsf	15	0	4	0,27	1	7%
	<b>Total</b>	<b>28</b>	<b>13</b>	<b>23</b>		<b>12</b>	<b>43%</b>
2014	sf	13	24	35	2,69	16	123%
	nsf	3	0	10	3,33	0	0%
	<b>Total</b>	<b>16</b>	<b>24</b>	<b>45</b>		<b>16</b>	<b>100%</b>
2015	sf	14	13	22	1,57	11	79%
	nsf	2	0	0	0,00	1	50%

	<b>Total</b>	<b>16</b>	<b>13</b>	<b>22</b>		<b>12</b>	<b>75%</b>
2016	sf	12	23	34	2,83	21	175%
	nsf	2	0	1	0,50	0	0%
	<b>Total</b>	<b>14</b>	<b>23</b>	<b>35</b>		<b>21</b>	<b>150%</b>

\* *Regular competition* defines the competition to the study programme in terms of the total number of applications (candidates) per place

The admission of students to the SP of FAM is sufficient. In 2016, it increased almost twice, which also shows increasing popularity of the SP.

## 5.2. Changes in the number of students: dropout rate and its causes

**Table 5.2.1. Dropout rate in the study programme of Financial and Insurance Mathematics**

Year of admission	Number of admitted students	Number of dropouts				Year of graduation	Dropout rate, %
		1 <sup>st</sup> year of study	2 <sup>nd</sup> year of study	Total during the SP implementation period	Total during the SP implementation period		
2012	sf 13	1	0	2014	1	7,69%	
	nsf 0	0	0		0	-	
Total	sf + nsf 13	1	0		1	7,69%	
2013	sf 11	3	1	2015	4	36,36%	
	snf 1	0	0		0	0,00%	
Total	sf + nsf 12	3	1		4	33,33%	
2014	sf 16	1	0	2016	1	6,25%	
	nsn 0	0	0		0	-	
Total	sf + nsf 16	1	0		1	6,25%	
2015	sf 11	1	0	2017	1	9,09%	
	nsf 1	0	0		0	0,00%	
Total	sf + nsf 12	1	0		1	8,33%	
2016	sf 21	1	0	2018	1	4,76%	
	snf 0	0	0		0	-	
Total	sf + nsf 21	1	0		1	4,76%	
<b>Grand total during the period</b>	<b>sf 72</b>	<b>7</b>	<b>1</b>		<b>8</b>	<b>11,11%</b>	
	<b>nsf 2</b>	<b>0</b>	<b>0</b>		<b>0</b>	<b>0,00%</b>	
	<b>sf + nsf 74</b>	<b>7</b>	<b>1</b>		<b>8</b>	<b>10,81%</b>	

**Table 5.2.2. Causes of leaving the university in the period between 2012 and 2016**

	Year of study	Year of admission					Total
		2012	2013	2014	2015	2016	
Failure to meet financial obligations	1 <sup>st</sup>	0	0	0	0	0	<b>0</b>
	2 <sup>nd</sup>	0	0	0	0	0	<b>0</b>
Unsatisfactory academic results	1 <sup>st</sup>	0	0	0	0	0	<b>0</b>
	2 <sup>nd</sup>	0	0	0	0	0	<b>0</b>
Academic dishonesty during the assessment of academic progress	1 <sup>st</sup>	0	0	0	0	0	<b>0</b>
	2 <sup>nd</sup>	0	0	0	0	0	<b>0</b>



Family reasons	1 <sup>st</sup>	0	0	0	0	0	0
	2 <sup>nd</sup>	0	0	0	0	0	0
Failure to renew studies after academic leave or suspension of studies	1 <sup>st</sup>	0	0	1	0	0	1
	2 <sup>nd</sup>	0	0	0	0	0	0
The student's own free will	1 <sup>st</sup>	1	3	0	1	1	6
	2 <sup>nd</sup>	0	1	0	0	0	1
Transfer to another higher education institution	1 <sup>st</sup>	0	0	0	0	0	0
	2 <sup>nd</sup>	0	0	0	0	0	0

The dropout level in the SP is rather low, on average, 1 student per admission year, typically, because of “student’s own free will.” An exception is the admission year 2013 when 4 students left the university. Apparently, the reason for that was the impossibility to balance the job and studies because of the unfavorable schedule of the lectures that year.

### 5.3. Organization of studies and academic support to the students

The aim of the study process is to ensure an effective implementation of the study programme so that the purpose is attained and learning outcomes of the SP are developed.

Information on the studies is provided by different institutions, from the Department for Studies and the Dean’s Office of the Faculty of Mathematics and Informatics to the academic staff of the study programme of Financial and Insurance Mathematics and tutors appointed by the Students’ Representation. The website set up by the Department for Studies ([www.klausk.vu.lt](http://www.klausk.vu.lt)) provides access to the ask-and-get-an-answer system, where answers to questions are provided by representatives of the Department for Studies or the Faculties. This is a very fast and convenient system saving time and replacing more time-consuming face-to-face communication in the office.

All information about the study process (study calendar, timetables of lectures and examinations, optional course and modules, the procedure of assessment and retaking the examinations), about partial studies abroad, tuition fees, grants, funding of studies is provided by the Faculty administrative staff responsible for studies, Vice-dean for Studies and Chair of the SPC. The information is available at <http://mif.vu.lt/lt3/studijos/studiju-programos/ma-studiju-programos>, <http://mif.vu.lt/lt3/studijos>, and <https://mif.vu.lt/timetable/mif/>. Another option would be the Vilnius University information system of studies, or VUSIS. There the students can access personal data, copies of relevant orders, study plan, examination timetable and results, etc. The students can also actively participate in the process of study by enrolling in optional courses and modules or courses of general university education, etc.

All timetables of the upcoming semester become available online, as a rule, no later than two months before the beginning of semester. Upon the completion of the first semester, as provided by the *Regulations for Studies of Vilnius University*, all students have an opportunity to study according to their individual study plans. For that purpose, their applications, including sound motivation, shall be submitted to the Dean’s office and approved by the Dean.

Questions related to the learning outcomes, the content of a course unit or module, career opportunities are within the responsibility of the Chair of the Study Programme Committee and the academic staff of the programme. They are all available for consultation at the time specified in advance or between/after the classes, or can be reached by electronic mail. Career opportunities are discussed during the classes, at the meetings with the Faculty alumni, and potential employers.

As provided in the *Regulations for Studies of Vilnius University*, students facing problems ensuing from unsatisfactory academic results are eligible for a second attempt. If they fail an examination, they may retake it once. If they fail the second time, they may repeat the whole course (module) by attending it together with other students who take it for the first time and reset the examination one year later. Those who have accumulated 15 credits of failed courses (modules) shall be expelled from the University and may renew their studies after having passed all relevant examinations.

Those who disagree with the examination procedure or the results, may launch an appeal to the Appeal Commission of the Faculty no later than five days after the results become available. A decision reached by

the Appeal Commission on the results shall be final and not subject to further appeal. However, the examination procedure may be subject to further appeal at the VU Dispute Tribunal.

Students having health problems may take academic leave upon submitting a medical certificate; the leave shall be no longer than two years. Academic maternity leave may also be granted; it shall be no longer than three years. Upon the Dean's approval, the student, having a sound reason, may suspend his/her studies for one year.

The Students' Representation of Vilnius University deals with various problems of the students, defends their interests, takes care of their academic and social welfare, organizes events of culture, fosters University traditions of student life, helps first-year students in their integration into the University community. Usually the Student Representation appoints a tutor, a senior student, who is a contact person in matters of different nature for all first-year students.

In 2016 Vilnius University has started a new project for preparing academic consultants, who would be working in every faculty of the university. Head of Students Office has been assigned for this project in the faculty of Mathematics and Informatics. The purpose of such consultant is helping students, who have different difficulties during their study process. Usually these students have already several failed courses and they are probable drop-outs. Academic consultant helps making a plan and finding possible solutions for a student to be able to continue studies and graduate Vilnius University according to their capabilities.

#### **5.4. Social support to the students: grants, loans, tuition fees, hostels**

The main form of social support to the students is financial allocations. The students may be eligible for the following: special grants for academic excellence (in 2012-2016, the students of the SP received 15 such grants), social grants (in 2012-2016, no grants), single social allowances (in 2012-2016, no grants), and single special social allowances (in 2012-2016, 3 grants).

Another form of social support is loans provided to the students by the state (administered by the State Studies Foundation) and allowances for students with disabilities (This is administered by the Department for the Affairs of the Disabled under the Ministry of Social Security and Labor of the Republic of Lithuania). Information on the procedure of allocating and disbursing the above allowances is accessible on the VU website<sup>12</sup>. All the above forms of social support are introduced to the students admitted to the study programme of Financial and Actuarial Mathematics during the introductory lectures of the first semester.

Accommodating students, residents of towns and villages outside Vilnius, in the hostels of Vilnius University might also be treated as social support. The demand for hostels is fully satisfied (95 % of all applications). Students in need of social support or with disabilities are eligible for a reduction when paying for the hostel. Especially talented students manifesting academic excellence and taking part in research may be eligible for special VU grants according to study and research fields. More information is available on the VU website<sup>13</sup>. In 2016, one student of the study programme received grant of C.M. Gruodis Foundation.

Moreover, Vilnius University offers professional psychological assistance to students and staff through the Psychological Training and Research Centre. Single consultations or cycles of consultations might be helpful to those facing problems of private or family life, social integration or studies.

#### **5.5. Students' participation in research, sports and arts**

Many our students are able do research worth publishing and even continue research in doctoral studies. However, often remain unpublished because, after graduation, the students prefer concentrate on their jobs. We give some examples of resultative research:

1. **E. Ignataviciūtė, R. Mikalauskaitė-Arminienė, J. Šiaulys**, Lee-Carter mortality forecasting. *Lithuanian Journal of Statistics*, 51(1), 5-13, 2012.

<sup>12</sup> See <http://www.vu.lt/lt/studijos/studiju-procesas/finansine-parama>.

<sup>13</sup> See [http://www.vu.lt/lt/studijos/studiju-procesas/finansine-parama#vardines\\_stipendijos](http://www.vu.lt/lt/studijos/studiju-procesas/finansine-parama#vardines_stipendijos).

2. **J. Damarackas**, J. Šiaulys, Bi-seasonal discrete time risk model. *Applied Mathematics and Computation* 247, 930–940, 2014.
3. **J. Damarackas**, J. Šiaulys, A note on the net profit condition for discrete and classical risk model. *Lithuanian Mathematical Journal*, 55(4), 465-473, 2015.
4. **I.M. Andriulytė**, E. Bernackaitė, **D. Kievinaitė**, J. Šiaulys, A Ludberg-type inequality for an inhomogeneous renewal risk model. *Modern Stochastics: Theory and Applications*, 2, 173-184, 2015.
5. S. Danilenko, **S. Paškauskaitė**, J. Šiaulys, Random convolution of inhomogeneous distributions with O-exponential tail. *Modern Stochastics: Theory and Applications*, 3, 79–94, 2016.
6. **E. Kizinevič**, **J. Sprindys**, J. Šiaulys, Randomly stopped sums with consistently varying distributions. *Modern Stochastics: Theory and Applications*, 3, 165-179, 2016.
7. **N. Šiškina**, J. Šiaulys, ARMA models for mortality forecast. *Lithuanian Journal of Statistics*, 55(1), 31-44, 2016.
8. **G. Mongirdaitė**, V. Mackevičius, On the backward Kolmogorov equation for CIR-type processes, Lecture at the LMS Conf., 2016 (paper in preparation).
9. **I.M. Andriulytė**, J. Šiaulys, Randomly stopped maximum and maximum of sums with consistently varying distributions, 2016 (submitted).
10. **D. Kievinaitė**, J. Šiaulys, Exponential estimates for the tail probability of the inhomogeneous random walk supremum, 2017 (paper in preparation).
11. **T. Kuras**, V. Mackevičius, Theoretical justification of the convergence rate of Andersen's QE approximation, 2017 (paper in preparation)

The students enrolled in the study programme of Financial and Insurance Mathematics, like any other VU students or staff, have multiple opportunities of self-expression outside their classes, usually in sports, arts and music<sup>14</sup>.

The Health and Sport Centre of Vilnius University offers the programme of healthy lifestyle intended for the students and academic staff. The Centre has three gyms and/or stadiums in Vilnius (Saulėtekio al. 2, Saulėtekio al. 26, M. K. Čiurlionio St. 21/27). The students may make use of the facilities and equipment of the Centre, join general training classes or enroll in individual training programmes, choose a particular sport. In the Centre, people may, individually or in groups, engage in a number of sporting activities such as jogging, fitness, basketball, football, table tennis, volleyball, etc.

A number of choirs, drama troupes, orchestras and ensembles are available at the VU Centre of Culture. They can be frequently seen performing in many national and international festivals in Lithuania and abroad. The students are offered multiple opportunities of participation in the activities of the Students' Representation of the Faculty of Mathematics and Informatics (MIFSA) and of Vilnius University (VUSA). The bodies representing the students aim at ensuring that such representation at all levels in VU is based on the students' needs and is high-quality, also at strengthening the self-governance of the students, etc. VUSA issues student-oriented newspaper *Studentų era*, which is the largest publication of this type in Lithuania. Each spring MIFSA and initiative students organize MIDI (Days of Mathematicians and Informaticians), which last about 10 days with a wide variety of interesting events, for example, a rock opera related to mathematics, press conference of teachers, chess championship, etc.<sup>15</sup>

## 5.6. Student exchange programmes

Studies abroad and processes of international cooperation in Vilnius University are administered by the International Programmes and Relations Office. At the Faculty of Mathematics and Informatics, such responsibility is assigned to Dr. Mindaugas Skujus (until 2016, international cooperation was coordinated

<sup>14</sup> <http://www.ssc.vu.lt/cms/> and <http://www.kultura.vu.lt/>

<sup>15</sup> <http://midi.lt/2017>, <http://midi.lt/2016>, and so on.

by Dr. Paulius Drungilas), who coordinates the process of exchange studies (both leaving and incoming students) and professors visiting the Faculty in the frame of exchange programmes, e.g., Erasmus+. The coordinator is also responsible for extending the network of academic exchange partners.

The students of the Faculty have multiple opportunities to enroll in partial studies of one semester or one academic year study within the exchange programmes Erasmus and Erasmus+ and bilateral agreements. The Faculty has Erasmus agreements with a number of European universities:

**Table 5.6.1. ERASMUS agreements concluded by the Faculty of Mathematics and Informatics**

No.	University/ other HEI	Number of Erasmus agreements			
		BA	MA	PHD	Academic staff
1.	Fachhochschulstudiengänge Burgenland GmbH	1	1		1
2.	Johannes Kepler Universität Linz	1	1		1
3.	Haute Ecole Robert Schuman	2			1
4.	Katholieke Hogeschool Leuven	2			1
5.	Universität Basel	1	1		1
6.	Universität Zürich		2		1
7.	ETH Zürich		1		1
8.	Otto-Friedrich-Universität Bamberg	1	1		1
9.	Universität Bielefeld	1	1		2
10.	Universität Duisburg-Essen	2	2	2	1
11.	Ernst-Moritz-Arndt-Universität Greifswald	1			1
12.	Friedrich Schiller Universität Jena	1	1		2
13.	Universität Kassel	1	1		1
14.	Aalborg Universitet	1	1		1
15.	University of Copenhagen	1			1
16.	Zealand Institute of Technology and Business, Campus Roskilde	6			1
17.	Universidad de Castilla La-Mancha	2	2		1
18.	University of Cordoba	2			1
19.	Universidad de Granada	3			1
20.	Universidad de Las Palmas de Gran Canaria	2	1		1
21.	Universite de Savoie	1	1		1
22.	ENSIIE	1	1		1
23.	Telecom SudParis		2	1	1
24.	Universite Lille 1	1	1		1
25.	Universite de Lorraine	1	1		1
26.	Universite de Nantes	1	1		1
27.	Universite D'Orleans, Ecole Polytechnique de l'Universite d'Orleans	2			1
28.	Universite de Rouen	1			
29.	Universite Jean Monnet (UJM) de Saint Etienne	1	1		1
30.	Athens University of Economics&Business	1			1
31.	University of Ioannina	1	1		1
32.	University of Thessaly	1	1		2
33.	Libera Università di Bolzano	4	4		1
34.	Università degli Studi di Catania	1	1		1
35.	Università degli Studi Magna Graecia di Catanzaro	1	1		1
36.	Università degli Studi di Ferrara	1	1		1

37.	Universita Cattolica del Sacro Cuore		4		1
38.	Universita degli Studi di Padova	2	1		1
39.	Riga Technical University	1	1		2
40.	Vrije Universiteit Amsterdam	1			
41.	Rijksuniversiteit Groningen	1			1
42.	Hanzehogeschool Groningen	2			1
43.	Radboud University		1		1
44.	Tilburg University	1			
45.	Universiteit Utrecht	1			
46.	Universidade de Evora	1	1		1
47.	Universidade Nova De Lisboa, ISEGI NOVA	1			1
48.	Universidade de Lisboa, Tecnico Lisboa		2		1
49.	Universidade do Porto	1			1
50.	University of Silesia	2	1	1	1
51.	Karol Adamiecki University of Economics	1	1		1
52.	West Pomeranian University of Technology, Szczecin	2			2
53.	Uniwersytet Warszawski	2			1
54.	Warsaw University of Technology	1			1
55.	Mälardalens Högskola	2	1		1
56.	University of Ljubljana	1			1
57.	University of Economics in Bratislava	1			1
58.	Trakya University	1	1		1
59.	Anadolu University	1	1		1
60.	Marmara University	2			1

**Table 5.6.2. ERASMUS agreements concluded by the Institute of Mathematics and Informatics**

No.	University/ other HEI	Number of Erasmus agreements			
		BA	MA	PHD	Academic staff
1.	Vienna University of Technology			1	2
2.	Sofia University			1	1
3.	Technical University Sofia			2	2
4.	University of South Bohemia			1	1
5.	Technical University of Liberec		1	1	1
6.	Universität Siegen			1	1
7.	Universidad del Pais Vasco, Faculty of Engineering		1	1	2
8.	Universidad del Pais Vasco, Faculty of Informatics	1			1
9.	Universidad de Granada	2			2
10.	Universidad de Malaga			2	1
11.	University of Tartu		1	1	1
12.	Ionian University		1	1	1
13.	Eötvös Loránd University		1	1	1
14.	Budapest University of Technology and Economics		1	1	2
15.	University of Calabria		1	1	2
16.	Universita degli Studi di Ferrara		1	1	2

17.	Universita degli Studi di Milano	1		1	1
18.	Universita degli Studi di Napoli Federico II			2	2
19.	Universita degli Studi di Pavia	1	1	1	1
20.	Latvijas Universitate			1	1
21.	University of Information Science and Technology Saint Paul the Apostle Ohrid		1	1	1
22.	SS. Cyril and Methodius University in Skopje	1	1	1	2
23.	Technische Universiteit Eindhoven			1	1
24.	Rijksuniversiteit Groningen			1	1
25.	Radboud University				2
26.	Universidade de Aveiro	1		1	1
27.	University of Algarve			1	2
28.	Universidade do Porto			1	1
29.	Gdansk University of Technology		1	1	2
30.	The AGH University of Science and Technology	1	1		1
31.	University of Pitesti	1		1	1
32.	University of Jyväskylä			1	1
33.	University of Eastern Finland			1	1
34.	University of Tampere			1	1
35.	University of Turku		1	1	1
36.	University of Ljubljana			1	1
37.	University of Maribor		1	1	1
38.	Catholic University in Ruzomberok	1	1		2
39.	Ankara University			1	1
40.	Hacettepe University		1	1	1
41.	Middle East Technical University		1	1	2
42.	Pamukkale Universitesi		1	1	1
43.	Eskisehir Osmangazi University	2	2	2	1
44.	Izmir University of Economics	1	1	1	1
45.	Selcuk University			1	1

Even though Vilnius University provides wide enough opportunities to study abroad, participation in exchange programmes of students of FAM is rather low (see the table below). The main reason seems to be the almost total employment of the students. However, we see a good tendency in 2017.

**Table 5.6.2. Student mobility in the SP (outgoing)**

Year of study	Number of outgoing students	Institution (country)
2012	0	
2013	0	
2014	0	
2015	1	University of Duisburg-Essen, Germany
2016	1	University of Copenhagen, Denmark
2017, spring	3	Ljubljana University, Slovenia; Universidade de Lisboa, Portugal; The University of Padova, Italy

**Table 5.6.3. Student mobility in the SP (ingoing)**

Year of study	Number of outgoing students	Institution (country)
2012	0	
2013	0	
2014	0	

2015	1	China
2016	3	Latvia, Korea

## 5.7. Assessment of academic progress

The procedure of assessing academic progress, retaking the examinations and of appeals of students dissatisfied with their assessment results is stipulated in Vilnius University by the *Regulations for Studies*, the *Procedure of Assessing Academic Progress* and the *Regulations of the Appeal Commission for Assessing Academic Progress in a Core Academic Unit of Vilnius University*.<sup>16</sup>

All information on the assessment of academic progress, schedule of examinations, failed examinations and retaking them is available on the VU website.<sup>17</sup>

During the first class, each SP academic staff member shall introduce the syllabus of the course (module) by focusing on its aim, learning outcomes, content, study and assessment methods as well as assessment strategy. The assessment criteria and the importance of meeting the deadlines are also discussed.

The system of assessment is specified in the course unit description.

Academic progress may be assessed in different ways; several methods may be combined, such as continuous, mid-term and final assessment. The final assessment is mandatory<sup>18</sup>. The final mark for the course unit may be cumulative, calculated on the basis of the proportions specified in the course unit description. The form of the final assessment in Vilnius University is an examination. If the course unit extends over several semesters, all but final semester of the course unit end in a pass/fail assessment.

The examinations may be oral and/or written. Currently, Vilnius University employs a 10-point assessment scale<sup>19</sup>. The points on the scale are defined as “excellent, exceptional knowledge and skills, average knowledge and skills, some inessential mistakes”, etc.

**Table 5.7.1. Vilnius University scale of assessment and marks**

Pass, fail	System of assessment	Description
PASS	10 (excellent)	Excellent, exceptional knowledge and skills
	9 (very good)	Very good knowledge and skills
	8 (good)	Knowledge and skills are above average
	7 (average)	Average knowledge and skills, some inessential mistakes
	6 (satisfactory)	Knowledge and skills are below average, there are errors
	5 (weak)	Knowledge and skills meet the minimum requirements
FAIL	4, 3, 2, 1 (unsatisfactory)	Below minimum requirements

The final mark is usually calculated on the basis of the marks for the examination paper, participation in seminars, individual or group project, final (oral and/or written) examination. All general principles of the assessment and of ensuring feedback are specified in the documents of Vilnius University: the *Procedure of Assessing Academic Progress* and the *Procedure of Ensuring Feedback to all Involved in the Study Process*<sup>20</sup>. After each semester, every student has a possibility to anonymously provide feedback about content, assessment methods, and teaching quality of the course. A standard questionnaire is used for such surveys. Survey results are provided to the teacher responsible for the course, Chair of the SPC and the Faculty Dean.

<sup>16</sup> *Regulations for Studies* approved by Decree No SK-2012-12-8 of Vilnius University Senate Commission 21 June 2012; available in Lithuanian at [http://www.vu.lt/site\\_files/SD/Studentams/SP/SRD/VU\\_studiju\\_nuostatai\\_naujoji\\_redakcija.pdf](http://www.vu.lt/site_files/SD/Studentams/SP/SRD/VU_studiju_nuostatai_naujoji_redakcija.pdf); *Procedure of Assessing Academic Progress* approved by Decree No SK-2012-20-6 of Vilnius University Senate 13 December 2012, available in Lithuanian at [http://www.vu.lt/site\\_files/SD/Studentams/Studiju\\_pasiekimu\\_vertinimo\\_Tvarka\\_12.21.pdf](http://www.vu.lt/site_files/SD/Studentams/Studiju_pasiekimu_vertinimo_Tvarka_12.21.pdf); *Regulations of the Appeal Commission for Assessing Academic Progress in a Core Academic Unit of Vilnius University* approved by Decree No SK-2012-20-3 of Vilnius University Senate Commission, available in Lithuanian at [http://www.vu.lt/site\\_files/SD/Studentams/Padalinio\\_akademines\\_etikos\\_komisijos\\_nuostatai.pdf](http://www.vu.lt/site_files/SD/Studentams/Padalinio_akademines_etikos_komisijos_nuostatai.pdf)).

<sup>17</sup> See <http://www.vu.lt/lt/studijos/studiju-procesas/egzaminu-sesija>.

<sup>18</sup> In the modular system, mid-term assessment is also mandatory.

<sup>19</sup> <http://www.vu.lt/lt/studijos/studiju-procesas/egzaminu-sesija/45-studijos/studijos/2591-vertinimo-sistema>. Also see the *Procedure of Assessing Academic Progress*: [http://www.vu.lt/lt/studijos/studiju-procesas/studijas-reglamentuojantys-dokumentai#vu\\_nutarimai](http://www.vu.lt/lt/studijos/studiju-procesas/studijas-reglamentuojantys-dokumentai#vu_nutarimai) [1 June 2012]

<sup>20</sup> See [http://www.vu.lt/site\\_files/SD/SK/SP\\_dalyviu\\_GR\\_tvarka.pdf](http://www.vu.lt/site_files/SD/SK/SP_dalyviu_GR_tvarka.pdf). Approved by VU Rector's Order No 115 2009 05 29.

After receiving feedback, the teacher may adjust course content and/or delivery methods if he/she thinks that suggestions made by students are reasonable.

The master graduation thesis is assessed by the Viva Voce Defense Committee of Graduation Theses in reference to the assessment criteria of graduation theses. Master thesis is defended at the public meeting. The student makes a presentation about 15 minutes, and 5 minutes are given for questions and discussion. Finally, the committee evaluates the presentation of Master thesis considering the opinions of the supervisor and reviewer. Members of the committee estimate the following elements of the master thesis and its presentation: Introduction, motivation, exposition, discussion, formal requirements.

Each member of the committee uses the 10-point system. The closed meeting of the committee agrees on a final assessment. The final mark is derived by averaging the marks of the committee members. If the supervisor and/or reviewer is a committee member, then their marks are not taken into account. The latter restriction is applied from 2016 in order to make the final mark more objective.

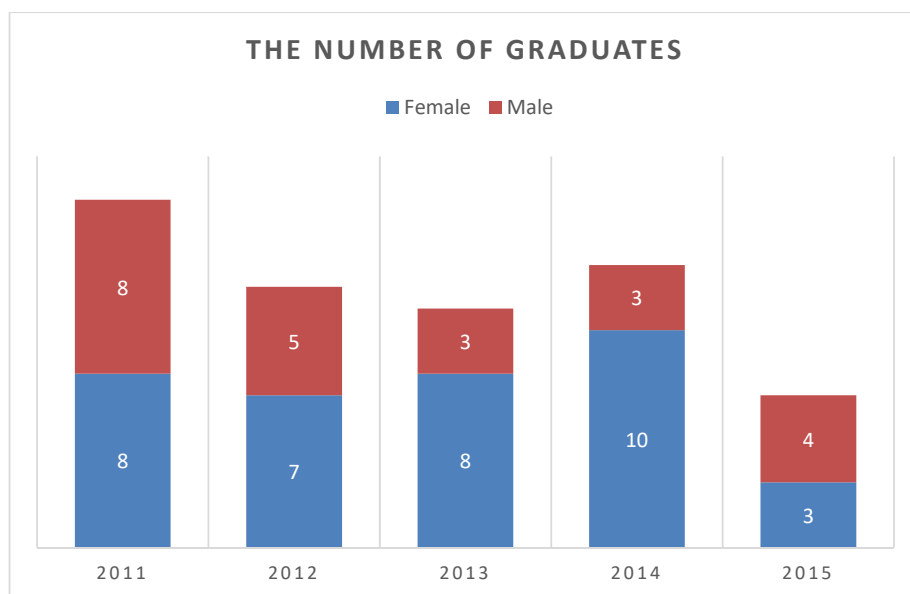
To ensure academic honesty during the studies, Vilnius University has taken various measures. The academic staff and the students shall adhere to the principles of ethics laid down in the *Code of Academic Ethics of Vilnius University*<sup>21</sup>, which defines general norms of academic, teaching, studies and research ethics. The Code also defines the notion of violation involving cheating, plagiarism, bribery, unsolicited dishonest assistance to the peers, etc.

The academic honesty is also ensured by the MIFSA programme *Sqžiningai* (Honestly): upon teacher's request, the voluntary observers are sent to the exams.

## 5.8. Professional activities of SP graduates

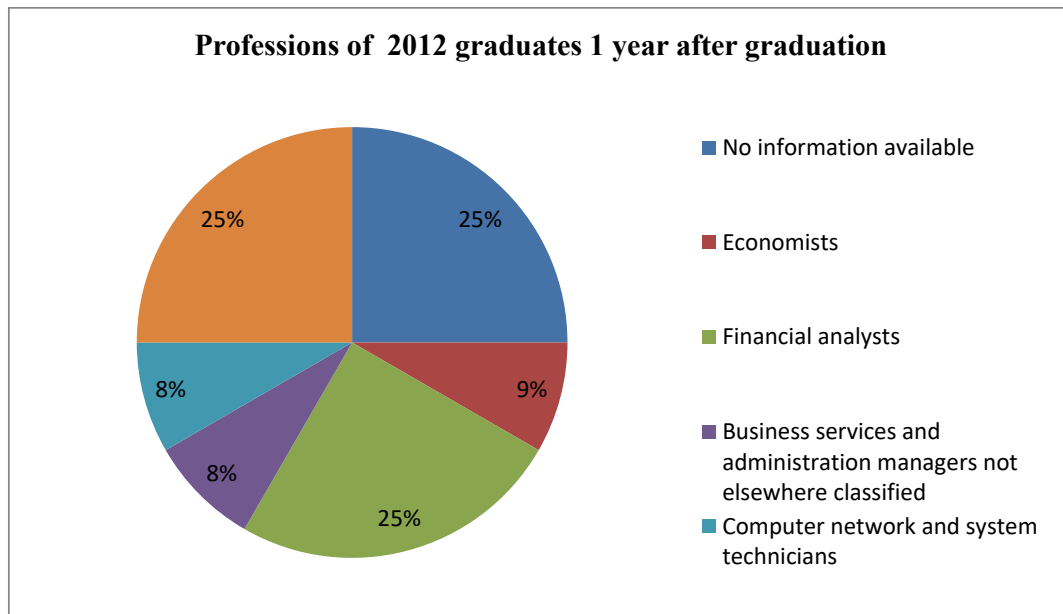
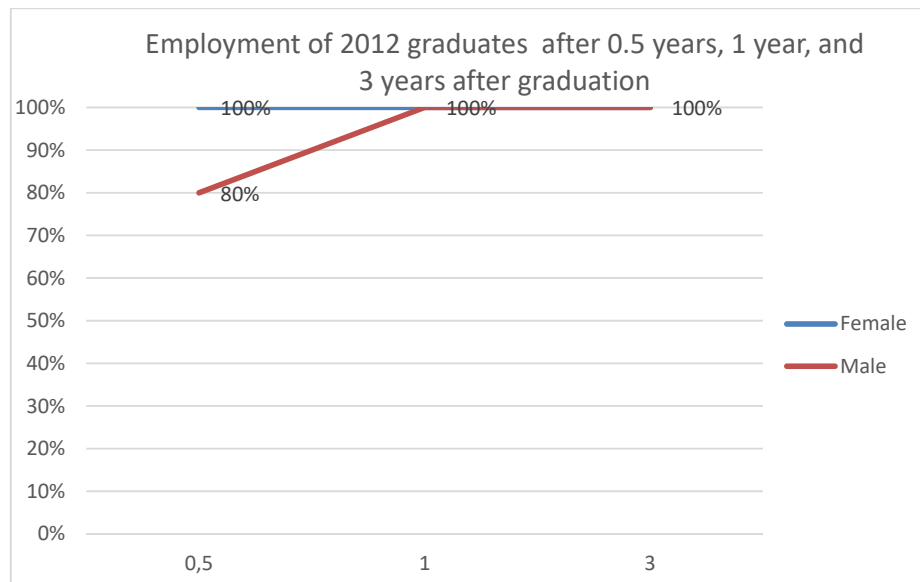
The system for collecting statistical data on activities of SP graduates at the university level is not fully implemented. Below, we present some available information. It is worth noting that:

- Almost all students find their jobs before graduation.
- Almost all graduates have their jobs related to finances or insurance.
- Despite high emigration level, **none** of the graduates emigrated from Lithuania.

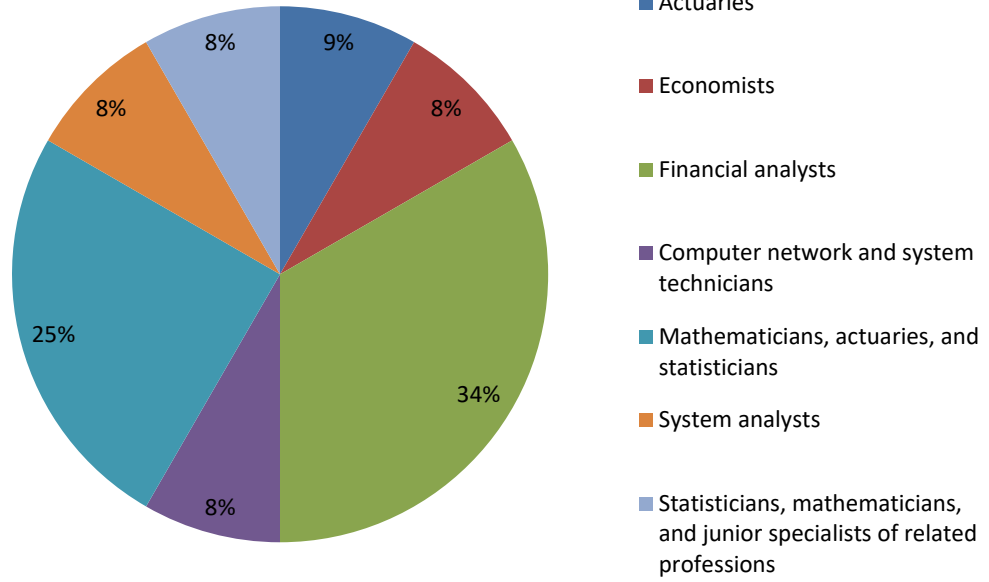


<sup>21</sup> *Code of Academic Ethics of Vilnius University* approved by the Senate Commission of Vilnius University 13 June 2006, Minutes No S-2006-05, available in Lithuanian at <http://www.vu.lt/lt/studijos/studiju-procesas/studijas-reglamentuojantys-dokumentai/45-studijos/studijos/2564-akademines-etikos-kodeksas>.





### Professions of 2012 graduates 3 years after graduation



**Table 5.8.1** Employment of 2015–2016 graduates

<b>2015: 7 graduates</b>	
SEB Bank, Accounting department	Specialist
Western Union	Specialist
KPMG Baltics UAB, Audit department	2 specialists
Barclays Bank, Investment department	specialist
Bank of Lithuania	Senior analyst
Vilnius University	PhD student
<b>2016: 14 graduates</b>	
Bank of Lithuania	Financial analyst
Danske bank	Financial analyst
AVIVA (insurance company)	2 actuaries
ADB Gjensidige (insurance company)	Actuary
Lietuvos draudimas (insurance company)	Senior actuary; actuary
Affecto Lietuva, IT services	2 specialists; 2 junior specialists
Barclays Technology Centre Limited, Lithuanian Division	Change manager
Nielsen Lietuva, Data department	Statistician
Swedbank, Investment department	Specialist

**Table 5.8.1** Employment of current students

<b>1st year students</b>	
Lietuvos draudimas (Insurance of Lithuania)	Pricing expert
Lietuvos draudimas	Software developer–analyst
PZU Lietuva Life insurance	Junior actuary
BTA Baltic Insurance Company	Property insurance specialist
BTA Baltic Insurance Company	Specialist
Ferratum	Risk and data analyst
Institute of Mathematics and Informatics	Specialist
ADB Gjensidige	Data analyst
ERGO Insurance SE	IT specialist
ERGO Insurance SE	Health insurance underwriter
ERGO Insurance SE	Underwriter–analyst
Aviva Lietuva	2 assistant actuaries
Swedbank AB	Reporting analyst
Swedbank AB	KYC analyst
Danske bank	Junior specialist
Danske bank	Analyst
Balto Link	Insurance broker
ESO (Energy distribution operator)	Economist assistant
<b>2nd year students</b>	
Lietuvos draudimas	Actuary
PZU Lietuva Life Insurance	Actuary
ERGO	Market analyst
BTA Insurance	Risk manager

SEB Life insurance	Junior actuary
Compensa Vienna Insurance Group	Junior actuary
Swedbank	Nonlife insurance actuary
Teo	Junior business analyst
Mindshare	media planner and analyst
Ministry of Social Security and Labor	Senior specialist–economist
SEB	Contact center specialist
ACNielsen Baltics	Statistician
Adform Lithuania	Product owner

## 5.9. Strengths and weaknesses of the area under evaluation and improvement measures to be taken

### Strengths:

- A number of students are involved into research activities every year. Moreover, talented students are supported financially via special scholarships or using external funds.
- Students can start their scientific career during their studies. They have possibilities to prepare scientific papers and opportunities to participate in scientific seminars, conferences, and projects.

### Weaknesses:

- The financial support for talented students could be more promising and stable.
- The demand for our students in the market is increasing every year. Students start working before completing their studies, some of them start working (part-time) already in the second year. This, affects students' performance and study results in a negative way.
- Relatively few students are taking part in exchange programmes, thus, losing a good chance to better prepare themselves for career in international environment.
- Although foreign students are welcome to study this SP, as a rule, the applicants have no sufficient prerequisites or financial resources.

### Improvement measures:

- More extensive promotion of Erasmus+ and other programs in order to increase students' international mobility.
- To consider the possibility to improve the financial support, at least for most talented students, in order to encourage the students to focus more on their studies.
- To allow the working students to have individual schedules with possibility to finish programme during four or five semesters.
- To increase the University fund to help students with financial difficulties.

## 6. Study Programme management

### 6.1. Regulation of study quality assurance

Fostering quality culture is a strategic aim of Vilnius University. It is made feasible by adhering to the values specified in the VU mission and in the *Standards and Guidelines for Quality Assurance in the European Higher Education Area*<sup>22</sup>. In Vilnius University, all study programmes and their implementation are

<sup>22</sup> *Standards and Guidelines for Quality Assurance in the European Higher Education Area*. See <http://www.enqa.eu/index.php/home/esg/>

administered by the Department for Studies, which is also responsible for ensuring the quality of functioning of the units at different levels in VU<sup>23</sup>.

The main document concerned with the internal quality insurance of studies is: *Vilnius University. Quality Manual*<sup>24</sup>.

When implementing and improving the processes and procedures of internal quality assurance, Vilnius University takes the responsibility for approving, monitoring and evaluating its study programmes and qualifications awarded, the evaluation criteria applicable to the new study programmes, the programme intended for newly recruited academic staff (see the publication *Manual of Vilnius University Lecturer*<sup>25</sup>). The University also organizes courses intended for the professional development of the academic staff, etc.<sup>26</sup>. As stipulated by the *Regulation of Study Programmes of Vilnius University*<sup>27</sup>, a study programme shall be updated and its quality monitored on a regular basis. The quality is assured and improved through its internal evaluation and external assessment, by making the results of such evaluation and assessment accessible to the community, by accumulating and analyzing the data about the programme and the process of study, by monitoring the feedback, ensuring the availability of facilities and learning resources, improving the qualifications of the academic staff, promoting the application of innovative methods of teaching, learning and assessment, improving the management of the programme and disseminating good practice<sup>28</sup>.

All modifications of the study programme shall be subject to discussion and approval by the Study Programme Committee and the Faculty Council. When modifications involve changes in the title, field (branch) of studies of the SP, qualification degree, awarded as a result of its completion, professional qualification or scope of the SP, they shall be approved by the SP Committee, the Faculty Council and finally, by the Senate. The process of SP updating is supervised by the Administration of Studies of Vilnius University.

In accordance with the *Regulation of Study Programmes of Vilnius University*, assuring and improving the SP quality is the responsibility of the SP Committee, which operates in accordance with the Regulations of the Study Programme Committee<sup>29</sup>. The Committee is in charge of the SP and the assurance of the quality of its implementation. It is accountable to the Faculty Council for the SP implementation and shall report to it at least once a year. The Committee is composed of academic staff, student and employer representatives; the composition is approved by the Senate upon the recommendation of the Faculty Council. The aims of the Committee are also enumerated in the *Regulations for Studies of Vilnius University*, the *Procedure of Approving Academic Results* and other documents.

## 6.2. Aims and responsibilities of the Study Programme Committee

The composition of the Study Programme Committee (hereinafter also SPC) is as follows: Prof. Vigirdas Mackevičius (chairman), Prof. Jonas Šiaulys, Prof. Remigijus Leipus, Dr. Donata Pupliauskaitė, and Partnership Prof. Gintaras Bakštys. The SPC was renewed in 2015 when the former chairman prof. V. Paulauskas retired from VU and the new SPC with chairman V. Mackevičius was approved on 22 September 2015 upon the Decision of the Senate No. S-2015-7-4. One of the key goals of the SPC is to seek the high quality of the programme so that its purpose is attained, its learning competences are developed, its content is compatible with the teaching, learning and assessment methods and the programme is competitive and relevant to the society. The SPC analyses feedback about the programme and its implementation received from different units of the Faculty, students, graduates, academic staff and social partners. In addition to standardized questionnaires launched by the Department for Studies, the SPC, on its own initiative, launch

<sup>23</sup> See <http://www.kvc.cr.vu.lt/site>.

<sup>24</sup> *Vilnius University. Quality Manual*. Vilnius, 2013. available in Lithuanian at <http://skvis.vu.lt/pub/book/qm/topic/10298430>.

<sup>25</sup> *Manual of Vilnius University Lecturer*. Vilnius, 2013. available in Lithuanian at [http://www.kvc.cr.vu.lt/site/sites/default/files/VU\\_destytojo\\_vadovas\\_4\\_16.pdf](http://www.kvc.cr.vu.lt/site/sites/default/files/VU_destytojo_vadovas_4_16.pdf).

<sup>26</sup> See <http://www.kvc.cr.vu.lt/site/?q=node/90>.

<sup>27</sup> Approved 21 June 2012. See [http://www.vu.lt/site\\_files/SD/Studiju\\_programu\\_reglamentas\\_2014\\_01\\_27.pdf](http://www.vu.lt/site_files/SD/Studiju_programu_reglamentas_2014_01_27.pdf). The document also specifies requirements for new study programmes (their preparation and registration) and the accreditation, evaluation and improvement of the existing study programmes.

<sup>28</sup> For more information about the processes of study quality improvement see <http://www.kvc.cr.vu.lt/site/>

<sup>29</sup> Approved 6 March 2014. [http://www.vu.lt/site\\_files/SD/Studentams/SP/SRD/SPK\\_nuostatai\\_03.06.pdf](http://www.vu.lt/site_files/SD/Studentams/SP/SRD/SPK_nuostatai_03.06.pdf)

its own questionnaire focusing on the improvement measures to be taken as well as any other issue relevant to the students. In search of viable solutions, the problems are usually discussed by the SPC members with the Faculty administration and the academic staff of the SP. The SPC shall ensure the update of the SP purpose and content; moreover, it shall participate in preparing and approving all documents related thereof (e.g. new course units descriptions prepared by the academic staff). All decisions of the SPC are taken by the simple majority of votes of its members. Another function of the SPC, usually performed by the chairman, is concerned with evaluating the competences acquired by the students in other SPs and deciding about the approval or disapproval of the academic results attained by those students in those SPs.

### **6.3. SP management database: Vilnius University information system of studies**

The Faculty administration and the academic staff make use of the Vilnius University information system of studies (VUSIS), which consists of several subsystems. One of them is meant for managing study programmes, offering access to people responsible for studies (Vice-dean for Studies, administrative staff, etc.). The administrative subsystem is an instrument for making, reviewing and editing study plans. Another subsystem is meant for managing the students and thus helps deal with the students' personal data, their marks for course units (modules), registration for optional course units (modules), titles of graduation theses; it helps issue certificates, approve the course units (modules) attended and assessed in another higher education institution. The subsystem also gives access to the results of considering the students' applications, marks for the course units (modules), etc. All orders related to the student affairs issued by the Dean or Rector (e.g. on the titles of annual papers or graduation theses, on business trips when going for partial studies in foreign universities, etc.) are prepared by VUSIS. The system also assists in issuing diploma supplements. VUSIS also stores admission data (competition, the number of admitted candidates by priority), various statistics related to students and studies. The academic staff members have online workplaces, where they can enter examination results, descriptions of course units (modules); they have access to the list of students enrolled in their course. VUSIS makes information management and the implementation of studies much easier.

### **6.4. Students' and graduates' feedback about the programme and its implementation**

Ways of getting feedback and handling it in Vilnius University are defined in the *Procedure of Ensuring Feedback to all Involved in the Study Process*<sup>30</sup>. Twice a year, at the end of each semester, the University launches questionnaires to be filled in by first and second cycle students through an electronic database. The questionnaires focus on the following:

1) On specific course units (modules) attended during the semester.

For that purpose, the same standardized course questionnaire is used in all the faculties of the University. Upon registration in the VU information system, a special slot on questionnaires opens up. There

- the students may anonymously evaluate their studies, including specific course units (modules);
- the academic staff members have direct access to the students' evaluation and feedback about their course units (modules);
- chairman of the SPC has direct access to the students' evaluation and feedback on all course units (modules) of the SP;
- The Faculty administration has direct access to the students' evaluation and feedback on all course units (modules) of the study programmes implemented by the Faculty.

2) On general satisfaction with the studies during the last semester.

Detailed results of the questionnaires according to units and study programmes are available in the slot "Feedback" of the section of the Administration of Studies on the VU intranet. Vilnius University makes use of the results of the standardized questionnaires for the following:

- to improve the SP and a particular course unit;
- to ensure the quality assurance and improvement by the SPC and the Faculty administration;

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<sup>30</sup> Approved 29 May 2009. See [http://www.vu.lt/site\\_files/SD/SK/SP\\_dalyviu\\_GR\\_tvarka.pdf](http://www.vu.lt/site_files/SD/SK/SP_dalyviu_GR_tvarka.pdf)

- to prepare for external assessment when drafting the self-evaluation report;
- to analyze new study programmes;
- to evaluate the qualifications of the academic staff;
- to improve other activities of the Faculty and the University.

Once the results of questionnaires' become available, SPC discusses them, formally and informally, with Faculty members teaching various programme course units, summarizes the good and the bad comments from students and implements necessary changes. However, we must recognize that students are not very active in filling out questionnaires. We believe that this is because the relationships between students and academic staff are quite friendly and the students feel free to share their problems directly with their teachers and, in particular, the chair of SPC or head of the Department. SPC is constantly striving to improve student and academic staff relations so that all achieve set goals.

### **6.5. Cooperation with social partners**

The programme has a large number of social partners from finance, insurance business and other companies: ERGO Lietuva, Danske Bank, Bank of Lithuania, AVIVA, Lithuanian Actuarial Society, to name a few. A senior actuary of the insurance company ERGO, partnership professor Dr. G. Bakštys is a member of SPC and a chairperson of the Master thesis defense committee. Social partners are invited to participate and to make proposals at the meetings of SPC and at regular meetings each quarter, approximately. Social partners also actively participate in the Seminar of Financial and Actuarial Mathematics, which takes place in the Faculty (Naugarduko St. 24) every Tuesday at 5 p.m. The presenters at this seminar are the teachers, researchers, students, and social partners. The seminar topics cover a broad range of problems, related to theoretical, applied, and methodological questions in finance and insurance. In particular, social partners often present talks on current problems in finance and insurance, indicating the tendencies of the market and ways to implement them in the programme.

### **6.6. Strengths and weaknesses of the area under evaluation and improvement measures to be take**

#### Strengths:

- SPC maintains close relationship with the departments responsible for the implementation of the SP and with the representatives of social partners and employers.

#### Weaknesses:

- The implementation of SP is not fully controlled by the SPC (a decision of University is needed).

#### Improvement measures:

- Reduction of teaching load in order to improve teaching quality.
- SPC should be fully responsible for the implementation of the SP (a decision of University is needed).
- The salary system should be reorganized at the University level (as well as at the Faculty level) in order to improve research output and teaching quality.