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# STUDY PROGRAMME DESCRIPTION

| Title of the study programme | State code of the study programme |
|---|---|
| Financial and Actuarial Mathematics | **621G17001** |

| Official name of the awarding institution | Language(s) of instruction |
|---|---|
| Vilnius University | Lithuanian, English |

| Kind of study | Study cycle | Level of qualification under the Lithuanian Qualification Framework |
|---|---|---|
| University studies | second | **7** |

| Mode of studies; Length of the study programme (in years) | Study programme volume in credits | Total student's workload (in hours) | Contact hours | Self-study hours |
|---|---|---|---|---|
| 1.5 | 90 | 2400 | 666 | 1734 |

| Study area | Study field | Branch of study field |
|---|---|---|
| Physical sciences | Mathematics | Financial and Actuarial Mathematics |
| **Qualification degree/Professional qualification awarded** | | |
| Master of Financial and Actuarial Mathematics | | |

| Programme director | Contact information |
|---|---|
| **Prof. habil. dr. Vigirdas Mackevičius** | **vigirdas.mackevicius@mif.vu.lt** |

| Accrediting body | Period of accreditation |
|---|---|
| Centre for Quality Assessment in Higher Education | 15 June 2017 |

**Aim 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.

| Content of the study programme: course unit groups | Distinctive features of the study programme |
|---|---|
| Master studies last three semesters. During the first semester, students have opportunity to deepen their mathematical skills and acquire knowledge necessary to build financial and actuarial competencies. During the second semester, the main emphasis is on the so-called core areas of financial and actuarial mathematics. Students are supposed to prepare master thesis (30 ECTS credits) during the last semester.<br>**The study programme consists of four unit groups** (see below). Students are encouraged to adapt (with necessary limitations) their programme to their needs by choosing any elective course from the proposed list.<br>**Advanced mathematics, 13 credits** (Probability theory and mathematical statistics, Selected chapters of analysis).<br>**Stochastic analysis, 11 credits** (Stochastic analysis, Stochastic models of financial mathematics).<br>**Actuarial mathematics, 19 credits** (Nonlife insurance, Life and health insurance, Risk theory, Pension funds, Dynamic aspects of survival theory)<br>**Financial mathematics, 17 credits** (Financial mathematics, Time series analysis, Financial derivatives, Risk management). | • The focus is on theoretical results, including current research, which allow understanding processes observed in practice. Students are taught to explain the possibilities and restrictions of applying theoretical models in practice.<br>• Acquired qualification agrees with the membership requirements of Lithuanian Actuarial Society<br>• The competencies in Financial and Actuarial Mathematics Master programme match the requirements of international labor market.<br>• The best students are encouraged to publish their works in national and international journals. |

| Admission requirements | Recognition of prior learning |
|---|---|
| Bachelor degree in financial and actuarial mathematics is typically required. Bachelors of mathematics, statistics, economics, or physics wishing to study the modern financial and actuarial mathematics and having sufficient proficiency are also welcome.<br>**Prerequisites.** Microeconomics and macroeconomics (minimum 4 credits); Probability theory (including theory of stochastic processes) and mathematical statistics (8 credits); Other disciplines of mathematics (20 credits); Basics of financial and actuarial mathematics (10 credits). All applicants must take an entrance motivation conversation on the basis of a presentation of their bachelor thesis, research paper, etc. (e.g., in probability theory, statistics, financial calculations, or actuarial mathematics). | Formally or informally acquired competencies are recognized as long as they agree with the programme. |

| Access to further studies |
|---|
| Graduates of the Master programme in financial and actuarial mathematics can pursue further studies at the doctoral level in mathematics and/or statistics. |

| Employability |
|---|
| Programme graduates can work in 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). |

| Teaching and learning methods | Assessment methods |
|---|---|
| Lectures, exercises, and seminars are complemented by case studies, problem-centered analysis, modelling, discussions, presentations, individual or group projects, portfolio creation. | The main form of evaluation is an examination. Every course unit is concluded with either a written or written-oral examination. Student's knowledge and general performance during the exam are evaluated using grading scale from 1 (very poor) to 10 (excellent), or by pass or fail evaluation in the cases where pass/fail evaluation is foreseen as a final evaluation of the course unit. |

| Study programme generic competences developed | | Study programme learning outcomes. The students will: | |
|---|---|---|---|
| 1. | **Abstract and critical thinking.** | 1.1 | Be able to use mathematical language in the proofs of new statements. |
| | | 1.2 | Dispose of enhanced analytical, critical, and conceptual problem solving and decision making capabilities and skills |
| 2. | **Work in a team and individually.** | 2.1 | Be able to work independently and in a team both as a leader and/or as a team member. |
| 3. | **Carrying on research work.** | 3.1 | Be able to analyze, systemize, and evaluate data necessary for research, professional activity, innovation, and problem solving. |
| | | 3.2 | Be able to apply new research results and appropriate methods for analyzing and solving problems or situations. |
| | | 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. | **Advanced theoretical knowledge in financial and actuarial mathematics.** | 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. | **Ability to apply mathematical knowledge and skills to analyzing and solving actuarial problems.** | 5.1 | Be able to apply the methods and models of actuarial mathematics to real-life problems. |
| | | 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. | **Ability to apply mathematical knowledge and skills to analyzing and investigating financial instruments and markets.** | 6.1 | Be able to model financial instruments and financial markets. |
| | | 6.2 | Be able to use stochastic analysis theory to analyze financial markets. |
| | | 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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## COURSE UNITS RELATION TO COMPETENCES AND LEARNING OUTCOMES

## STUDY PROGRAMME TEMPLATE (COURSE UNITS RELATION TO COMPETENCES AND LEARNING OUTCOMES)

| Code | Course units | Credits | Student's workload | Contact hours | Self-study hours | Competences | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | General 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 | 6.3 |
| **1st YEAR** | | 60 | **1600** | **650** | **950** | | | | | | | | | | | | | | |
| **SEMESTER 1** | | **30** | **800** | **324** | **476** | | | | | | | | | | | | | | |
| **Compulsory course units** | | **30** | **800** | **324** | **476** | | | | | | | | | | | | | | |
| | 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 | x | | | | |
| | Time series analysis | 6 | 158 | 64 | 94 | x | | x | | x | x | x | | | | | x | x | x |
| | Stochastic analysis | 6 | 154 | 66 | 88 | x | | | x | x | x | | | | | | | x | |
| **SEMESTER 2** | | **30** | **800** | **326** | **474** | | | | | | | | | | | | | | |
| **Compulsory course units** | | **20** | **574** | **226** | **348** | | | | | | | | | | | | | | |
| | 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 | x | | | |
| **Optional course units** | | **10** | **226** | **100** | **126** | | | | | | | | | | | | | | |
| | 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 | x |
| | Stochastic models of financial mathematics | 5 | 113 | 50 | 63 | x | x | | x | x | | x | | | | | x | | x |
| | Risk management | 5 | 113 | 50 | 63 | | | | | x | x | x | x | | x | | | | x |
| | Pension funds | 5 | 113 | 50 | 63 | | | x | | | x | | | x | x | x | | | |
| **2nd YEAR** | | **30** | **800** | **16** | **784** | | | | | | | | | | | | | | |
| **SEMESTER 3** | | **30** | **800** | **16** | **784** | | | | | | | | | | | | | | |
| | Master thesis | 30 | 800 | 16 | 784 | x | x | | x | x | x | | x | | | x | | | x |