Course Name	Introduction to Financial- and insurance mathematics
Contents and Objectives	<u>Life insurance mathematics</u> <u>Content:</u> fundamentals of life insurance, mortality models, present values and premiums, overview of the main types of insurance, net premiums, costs and gross premiums, actuarial reserves, net actuarial reserves, zillmerized actuarial reserves Objectives: Students will be able to understand the basics of calculation, management and risk assessment of traditional life insurance products. In particular, the terms and calculation bases commonly used in insurance practice (interest and mortality assumptions, cost approaches) are used and the most important life insurance products are analyzed. <u>Portfolio optimization:</u> <u>Content</u>: • Markowitz portfolio optimization model, efficient portfolios • Return and risk, risk preference • Portfolios with two or more assets • Capital market line • Vector optimization • Efficient frontier • Duality in portfolio optimization • Optimality constraints Qualification: The lecture addresses various mathematical models in portfolio optimization, which include risk assessments in various forms. Students become aware of balancing risk return and diversification. Students learn how to add risk-free assets to balance the portfolio. <u>Risk theory:</u> <u>Content</u>: • Non-life actuarial science - risk theory: Risk theoretical models, premium calculation principles, risk measures, simple ruin models Objectives: Students will learn the methods for calculating, planning and settling claims and property insurance and will be able to work with them confidently. They know the stochastic models used for the analysis of loss distributions and for the evaluation of risks and can apply them. <u>Stochastic simulation:</u> <u>Content</u>: • random number generators, simulation of uniform and arbitrary distributions, simulation of dependent random vectors, copulas, simulation of stochastic processes and option pricing, variance reduction Objectives: Students will learn the Monte-Carlo simulation technics and apply them to financial applications, particularly option pricing
Teaching	This course consists of lectures. Students are required to choose a total of 2 of the following lectures: Lecture: • Lecture: Life insurance mathematics (2h/week) • Lecture: Risk theory (2h/week) • Lecture: Portfolio optimization (2h/week)

	• Lecture: Stochastic simulation (2h/week) This class can be taught remotely.
Prerequisites	Basic knowledge in Analysis, Optimization and Stochastics
Examination	Oral exam (45 minutes)
Credits	6 ECTS points
Frequency	This course is given at least every second year.
Workload	The estimated total working time for this course is 180 hours.
Duration	This course is given during one semester.