

**MASTER IN ACTUARIAL AND FINANCIAL SCIENCES****Main Language of Instruction:**French ☒ English ☐ Arabic ☐**Campus Where The Program Is Offered:** CST**OBJECTIVES**

---

Since 2005, the Master in Actuarial and Financial Sciences (SAF) at the Faculty of Science of USJ has stood as the first program of its kind in Lebanon. It has established USJ as a leading institution in the formation of versatile actuarial professionals, valued across local and international markets.

The program highlights the essential role of actuaries in risk modeling, risk assessment, and strategic risk management. Often described as risk engineers, actuaries predict and anticipate future developments through advanced mathematical models and statistical analyses. Their expertise supports informed decision-making and strengthens risk management structures. Their prominent role in banking and insurance institutions positions them at the heart of today's financial challenges.

Recognized for its excellence, the SAF Master's program offers students a unique opportunity to acquire in-depth skills in the actuarial field. In partnership with the Institute of Financial Science and Insurance (ISFA) at the *Université Claude Bernard Lyon 1* (UCBL), the program delivers a dual degree, combining the academic rigor of USJ with the renowned expertise of ISFA. Beyond the academic aspect, the partnership between USJ and ISFA provides a gateway to the French Institute of Actuaries through the completion of an actuarial thesis. Graduates of the program also benefit from international recognition by the Society of Actuaries (SOA), further solidifying their status on the global stage.

The global network of partners formed by alumni of the Master's program facilitates access to top-tier professional opportunities, offering students a concrete perspective on the career prospects in this dynamic and constantly evolving field.

**PROGRAM LEARNING OUTCOMES (COMPETENCIES)**

---

- Analyze financial and insurance products
- Design pricing and actuarial analysis models
- Manage risks and optimize portfolios
- Pursue a professional career or doctoral studies

**ADMISSION REQUIREMENTS**

---

The SAF Master's program welcomes candidates who meet one of the following criteria:



- Hold a Bachelor in Mathematics from the Faculty of Science at USJ.
- Hold a Bachelor's degree or a transcript from the first year of a Master's program in Mathematics or a scientific discipline recognized as equivalent by the USJ Equivalence Commission.
- Hold an engineering degree recognized as equivalent by the USJ Equivalence Commission.

Admission is based on a review of the candidate's application, followed by an interview with a selection committee.

**COURSES/CREDITS GRANTED BY EQUIVALENCE**

---

At the request of the candidate for the SAF Master's program, it is possible to validate credits obtained during a course of study at a university other than USJ or within a faculty of USJ other than the Faculty of Science, by equivalence with the SAF Master's program. This validation is subject to a review of the application and approval by the USJ Equivalence Commission. The number of credits obtained by equivalence cannot exceed 50% of the credits required for the SAF Master's program.



## PROGRAM REQUIREMENTS

**Required Courses (120 Credits):** The SAF Master's program comprises a total of 120 ECTS credits that students must complete to obtain their degree. These credits are distributed across mandatory courses listed in the following study plan.

Those who successfully complete the program will receive a Master's degree in Science, Technology, and Health with a specialization in Actuarial Science from *Université Claude Bernard Lyon 1* (UCBL), as well as a Master in Actuarial and Financial Sciences from USJ. Additionally, candidates have the opportunity to obtain the actuary diploma in France after successfully defending their actuarial thesis, in accordance with the terms specified in the agreement between USJ and UCBL.

### Required Courses (120 Cr.)

Data Analysis and Clustering (3 Cr.); Basics of Civil Law and Business Law (2 Cr.); Stochastic Calculus (6 Cr.); Labor Law and Social Protection (2 Cr.); Econometrics (3 Cr.); Economics (2 Cr.); English (2 Cr.); Database Software (2 Cr.); Mathematical Optimization (2 Cr.); Inferential Statistics (4 Cr.); Simulation Techniques and Advanced Programming (2 Cr.); Life Insurance: Products, Regulations and Accounting; Group Pension / Employee Benefits (4 Cr.); Accounting, Financial Analysis and Taxation (3 Cr.); Insurance Contract Law (2 Cr.); Economics of Risk and Insurance (3 Cr.); Portfolio Management (2 Cr.); Actuarial Mathematics of Life Insurance (4 Cr.); Generalized Linear Models (3 Cr.); Non-life Insurance Provisioning Techniques (2 Cr.); Actuarial Internship (3 Cr.); Financial Theory (2 Cr.); Option Pricing Theory (2 Cr.); Data Science / Machine Learning (3 Cr.); Financial Markets (6 Cr.); Asset-Liability Management (3 Cr.); Duration Models (3 Cr.); Modelling Insurance Losses and Ruin Theory (3 Cr.); Advanced Pricing and Provisioning Practices (3 Cr.); Social Protection and Health Insurance (2 Cr.); Retirement and Pension Funds (2 Cr.); Time Series (2 Cr.); Extreme Values and Copulas Estimation (3 Cr.); Credibility and Bonus-Malus Systems (2 Cr.); Economic Behavior and Competitive Strategy (3 Cr.); Insurance and Bank Accounting (2 Cr.); Enterprise Risk Management (3 Cr.); Lebanese and Middle Eastern Markets (2 Cr.); Financial Models in Insurance and Generator of Economic Scenarios (3 Cr.); European and International Standards (3 Cr.); Reinsurance, Business Case in Reinsurance, Securitization (3 Cr.); Actuarial Thesis (9 Cr.).

## SUGGESTED STUDY PLAN

### Semester 1

Code	Course Name	Credits
o48ADDMM1	Data Analysis and Clustering	3
o48DCAMM1	Basics of Civil Law and Business Law	2
o48CASMM1	Stochastic Calculus	6
o48DTPMM1	Labor Law and Social Protection	2
o48ECOMM1	Econometrics	3
o48EMMMM1	Economics	2
o48ENGMM1	English	2
o48LBDMM1	Database Software	2
o48OPTMM1	Mathematical Optimization	2
o48STIMM1	Inferential Statistics	4
o48SPAMM1	Simulation Techniques and Advanced Programming	2
	<b>Total</b>	<b>30</b>

### Semester 2

Code	Course Name	Credits
o48ASVMM2	Life Insurance: Products, Regulations and Accounting; Group Pension / Employee Benefits	4
o48CAFMM2	Accounting, Financial Analysis and Taxation	3
o48DCAMM2	Insurance Contract Law	2
o48ERAMM2	Economics of Risk and Insurance	3
o48GPAMM2	Portfolio Management	2
o48MAAMM2	Actuarial Mathematics of Life Insurance	4
o48MLGMM2	Generalized Linear Models	3
o48PNVMM2	Non-life Insurance Provisioning Techniques	2
o48SAEMM2	Actuarial Internship	3
o48THFMM2	Financial Theory	2
o48THOMM2	Option Pricing Theory	2
	<b>Total</b>	<b>30</b>

### Semester 3

Code	Course Name	Credits
o48DASMM3	Data Science / Machine Learning	3
o48FIMMM3	Financial Markets	6
o48GAPMM3	Asset-Liability Management	3
o48MODMM3	Duration Models	3
o48CSRMM3	Modelling Insurance Losses and Ruin Theory	3
o48PAPMM3	Advanced Pricing and Provisioning Practices	3
o48PASMM3	Social Protection and Health Insurance	2
o48RFPMM3	Retirement and Pension Funds	2
o48SETMM3	Time Series	2
o48VECM3	Extreme Values and Copulas Estimation	3
	<b>Total</b>	<b>30</b>

### Semester 4

Code	Course Name	Credits
o48CBMMM4	Credibility and Bonus-Malus Systems	2
o48CESMM4	Economic Behavior and Competitive Strategy	3
o48CABMM4	Insurance and Bank Accounting	2
o48ERMMM4	Enterprise Risk Management	3
o48MLRMM4	Lebanese and Middle Eastern Markets	2
o48MFGMM4	Financial Models in Insurance and Generator of Economic Scenarios	3
o48NEIMM4	European and International Standards	3
o48RETMM4	Reinsurance, Business Case in Reinsurance, Securitization	3
o48SMAMM4	Actuarial Thesis	9
	<b>Total</b>	<b>30</b>

## COURSE DESCRIPTION

<b>o48ADDMM1</b>	<b>Data Analysis and Clustering</b>	<b>3 Cr.</b>
<p>This course aims to connect students' statistical knowledge to its practical application on data from businesses, banks, insurance companies, or financial markets during the first year of the master's program. This approach allows students to subsequently acquire interpretation methodologies specific to each field. The software used, such as SPSS and R, is commonly employed by many companies as an initial step in data interpretation before more in-depth analysis by experts. By the end of this course, students will be able to input data into the software, select relevant study samples, apply global descriptive tests and hypothesis tests specific to the questions asked, and master data classification techniques.</p>		
<b>o48ADDMM1</b>	<b>Data Analysis and Clustering</b>	<b>3 Cr.</b>
<p>This course aims to connect students' statistical knowledge to its practical application on data from businesses, banks, insurance companies, or financial markets during the first year of the master's program. This approach allows students to subsequently acquire interpretation methodologies specific to each field. The software used, such as SPSS and R, is commonly employed by many companies as an initial step in data interpretation before more in-depth analysis by experts. By the end of this course, students will be able to input data into the software, select relevant study samples, apply global descriptive tests and hypothesis tests specific to the questions asked, and master data classification techniques.</p>		
<b>o48DCAMM1</b>	<b>Basics of Civil Law and Business Law</b>	<b>2 Cr.</b>
<p>This course provides an essential legal foundation for advanced studies. It explores civil law, which governs relationships between individuals, whether physical or moral, and introduces the general principles of law and corporate law. Corporate law examines aspects related to the creation, operation, and liquidation of companies, as well as internal and external relationships. By the end of this course, students will be competent in analyzing, interpreting, and resolving every day or professional legal situations involving the concept of corporations.</p>		
<b>o48CASMM1</b>	<b>Stochastic Calculus</b>	<b>6 Cr.</b>
<p>This course explores stochastic processes, focusing on discrete-time martingales and discrete-state Markov chains, detailing their fundamental properties and key convergence theorems. The second part of the course examines continuous-time martingales, Brownian motion, stochastic integrals, Itô's formulas, and the resolution of stochastic differential equations. By the end of the course, students will be able to explore the valuation of financial options using stochastic techniques.</p>		
<b>o48DTPMM1</b>	<b>Labor Law and Social Protection</b>	<b>2 Cr.</b>
<p>This course offers a foundational understanding of insurance and labor law, focusing on the legal frameworks that regulate employer-employee relationships. It covers the creation, execution, and termination of employment contracts, union rights, workplace safety, and the protection of vulnerable workers. Additionally, it delves into social protection laws that safeguard individuals against social risks such as illness, disability, and unemployment. By the end of the course, students will be equipped with knowledge of their rights and obligations as employers or employees, as well as the key legal principles governing employment contracts.</p>		
<b>o48ECOMM1</b>	<b>Econometrics</b>	<b>3 Cr.</b>
<p>This course has both a narrow and broad scope. «Narrow» because it focuses exclusively on single-equation linear models (multiple linear regression); «broad» because its application extends to various fields beyond economics, encompassing all areas where evaluating causal relationships between statistical variables is relevant (marketing, ecology, health, psychology, sociology, etc.). The approach remains consistent in all cases, adopting statistical modeling: defining an application field (studied population, statistical individual), formalizing a causality problem (endogenous, candidate exogenous variables, expected outcomes), using data (sample) to validate or invalidate the formulated hypotheses (significant coefficients, analysis of variance), and interpreting and using the results (sign and value of the coefficients, prediction for a new individual).</p>		

<b>048EMMM1</b>	<b>Economics</b>	<b>2 Cr.</b>
-----------------	------------------	--------------

This course provides students with a comprehensive understanding of Microeconomics and Macroeconomics principles. Through the use of graphical and mathematical analysis, students will explore how changes in supply and demand influence prices within a market economy. The course also delves into the significance of elasticity for firms, as well as the concepts of inflation, unemployment, and fiscal policy. Furthermore, students will examine the interconnectedness between financial markets and the «real» economy, constructing a macroeconomic model that encompasses the Short Run and expands to encompass global interactions.

<b>048ENGMM1</b>	<b>English</b>	<b>2 Cr.</b>
------------------	----------------	--------------

This course is designed to introduce students to the terminology commonly utilized in the banking and insurance sectors. Throughout the program, students will engage in practical exercises encompassing various aspects of finance and insurance, such as dialogue creation, curriculum vitae (CV) writing, report compilation, and textual analysis. The course aims to enhance students' proficiency in the specific language and communication skills essential for effective engagement within the financial and insurance domains.

<b>048LBDMM1</b>	<b>Database Software</b>	<b>2 Cr.</b>
------------------	--------------------------	--------------

This course consists of two parts: Access and SAS. It aims to enable students to create and manage a complete database including tables, queries, forms, reports, and macros, as well as to develop a structured program using SAS. The main objective of this course is to familiarize students with the fundamental tools of ACCESS and SAS software through concrete examples of real-world applications. By the end of this course, students will be able to import and utilize Access databases in development environments such as Delphi, Visual Basic, WinDev, C++, and SAS.

<b>048OPTMM1</b>	<b>Mathematical Optimization</b>	<b>2 Cr.</b>
------------------	----------------------------------	--------------

This course aims to equip students with the skills necessary to model a real optimization problem into a mathematical problem. It also enables them to analyze the existence and uniqueness of an optimum of a function defined on a normed vector space, as well as to approximate the value of this optimum using classical numerical methods. By the end of the course, students will be able to transfer a concrete problem in the field of optimization into a mathematical framework, evaluate the characteristics of the optimum, and effectively apply numerical methods to estimate its value.

<b>048STIMM1</b>	<b>Inferential Statistics</b>	<b>4 Cr.</b>
------------------	-------------------------------	--------------

This course presents inferential statistics as the study of methods to infer unknown population characteristics from sample data. It covers estimation techniques, confidence intervals, and hypothesis testing. Students will use R to manipulate, visualize, and analyze real-world datasets, applying inferential statistical methods in practice.

<b>048SPAMM1</b>	<b>Simulation Techniques and Advanced Programming</b>	<b>2 Cr.</b>
------------------	---	--------------

This course explores the theory and practice of common random simulation techniques, as well as their implementation using standard computer tools. In the first part, it examines random simulation, Monte Carlo and Quasi-Monte Carlo methods, and variance reduction techniques. The second part focuses on developing dynamic libraries in C++ that can be imported into Excel. These libraries provide Excel users with the ability to externalize scientific calculations in C++, such as Monte Carlo simulations. Consequently, these dynamic libraries significantly reduce computation time by using C++, while benefiting from Excel's user-friendly interface.

<b>048ASVMM2</b>	<b>Life Insurance: Products, Regulations and Accounting; Group Pension / Employee Benefits</b>	<b>4 Cr.</b>
------------------	--	--------------

This course aims to familiarize students with life insurance products and group insurance plans. It includes an overview of the insurance market in Lebanon and the Middle East. Students will gain an understanding of the necessary steps for developing an insurance product, highlighting the actuary's role in this process.

<b>048CAFMM2</b>	<b>Accounting, Financial Analysis and Taxation</b>	<b>3 Cr.</b>
------------------	--	--------------

This course aims to provide a deep understanding of the fundamental principles of general accounting, enabling students to master the essential concepts and entries of financial accounting for the construction of annual accounts. Students will then be able to understand the taxation applied during an accounting period, including VAT, the National Social Security Fund, payroll taxes, and income taxes. The second objective is to analyze, assess, and interpret the components of the result of an accounting period, based on the analysis of the accounting and financial impacts of financing operations, a financial analysis of financial statements, and the analysis of the accounting and financial impacts of fiscal operations.

<b>048DCAMM2</b>	<b>Insurance Contract Law</b>	<b>2 Cr.</b>
------------------	-------------------------------	--------------

This course is an essential legal prerequisite for undertaking advanced studies in actuarial science. With the uncertainty of claims, policyholder premiums, and insurer profits, insurance regulation becomes crucial to protect all stakeholders in this sector, including the insured, the insurer, and even third parties (beneficiaries). Insurance law governs the relationships between policyholders and insurers through an in-depth study of an insurance policy. This policy specifies the offered guarantees, respective obligations, and the reasons for these obligations. Beyond analyzing insurance law articles, students will be able to recognize their rights, duties, and limits as policyholders or insurers.

<b>048ERAMM2</b>	<b>Economics of Risk and Insurance</b>	<b>3 Cr.</b>
------------------	--	--------------

This course aims to introduce insurance through the theory of lotteries, exploring preference criteria and utility functions. After a theoretical introduction, the application to insurance focuses on analyzing individual choices among different types of insurance and coverage, whether in a market with symmetric or asymmetric information. The second part of this course concentrates on defining these behaviors using mathematical models, considering one or more risk factors. By the end of this course, students will be able to distinguish various types of insurance contracts, understand the underlying economics of these contracts, and integrate the role of risk (single or multiple) as well as individual specificities in the process of choosing risk or the insurance intended to cover it.

<b>048GPAMM2</b>	<b>Portfolio Management</b>	<b>2 Cr.</b>
------------------	-----------------------------	--------------

This course examines both the theoretical foundations and empirical evidence essential for investment within the framework of portfolio management, with a primary focus on understanding and applying «modern portfolio theory.» By the end of the course, students will possess the ability to interpret key return measures, articulate risk aversion and its consequences for portfolio selection, and comprehend the significance of the minimum-variance and efficient frontiers of risky assets. Furthermore, students will gain proficiency in selecting the optimal portfolio based on an investor's utility and the capital allocation line, thereby acquiring practical skills for effective portfolio management.

<b>048MAAMM2</b>	<b>Actuarial Mathematics of Life Insurance</b>	<b>4 Cr.</b>
------------------	--	--------------

This course aims to provide students with the essential actuarial foundations necessary for understanding and technically analyzing life insurance operations. It explores international actuarial notations and delves into pricing methods, estimation of life probabilities, and widely used provisioning techniques in actuarial practice. This course also details premium loading techniques and methods for calculating reserves. Additionally, it covers supplementary topics such as commutations and profitability, thereby enriching the overall understanding of actuarial aspects related to life insurance.

<b>048MLGMM2</b>	<b>Generalized Linear Models</b>	<b>3 Cr.</b>
------------------	----------------------------------	--------------

This course presents the different regression models: simple and multiple linear models, generalized linear models, logistic regression, Poisson model. This course also introduces additional analysis tools for regression models including the analysis of variance. The presentation of the different concepts is done in the context of actuarial applications. By the end of the course, students will be able to establish the differences between all the models, choose the appropriate model according to the situation, and estimate parameters and use them.



<b>048PNVMM2</b>	<b>Non-life Insurance Provisioning Techniques</b>	<b>2 Cr.</b>
------------------	---	--------------

This course aims to equip students with the essential knowledge required for carrying out claims reserving activities within a non-life insurance or reinsurance company. It is structured into three distinct phases. The first phase outlines the general context of the non-life reserving process, providing an understanding of the principles, stakeholders, and key steps governing this practice. The second phase highlights the deterministic and stochastic methods currently used by market players. Finally, the third phase involves the development of a reserving tool in Excel, utilizing both deterministic and stochastic methods.

<b>048SAEMM2</b>	<b>Actuarial Internship</b>	<b>3 Cr.</b>
------------------	-----------------------------	--------------

This one-month internship is offered to first-year students in the Master's program in Actuarial and Financial Sciences. Its primary objective is to provide students with an initial immersion in the banking and insurance sectors, allowing them to gain practical experience and a first contact with the professional environment.

<b>048THFMM2</b>	<b>Financial Theory</b>	<b>2 Cr.</b>
------------------	-------------------------	--------------

This course covers the fundamental principles of financial theory in perfect markets, highlighting the Modigliani-Miller model and aspects related to corporate financing. The course also addresses the initial interest rate models and the methods for constructing the yield curve. Concrete examples are used to illustrate the practical application of the discussed theories.

<b>048THOMM2</b>	<b>Option Pricing Theory</b>	<b>2 Cr.</b>
------------------	------------------------------	--------------

This course equips students with the necessary tools to evaluate derivative products such as options in financial markets. The course focuses on the study of options markets, as well as the evaluation and hedging of derivative products in general, emphasizing their use in financial markets. The concepts of arbitrage, market completeness, and various valuation models (such as the binomial model, the multi-period tree, and the Black-Scholes model) are covered. Concrete examples are used to illustrate the practical application of the discussed theories.

<b>048DASMM3</b>	<b>Data Science / Machine Learning</b>	<b>3 Cr.</b>
------------------	--	--------------

This course presents statistical learning as a key tool for risk forecasting. It aims to explore the fundamental theoretical concepts of renowned algorithms used in this field, with a particular emphasis on tree-based techniques. Students will apply several algorithms and their extensions in the context of insurance pricing or reserving. This course contributes to the development of the following skills: exploration of various data sets, modeling, and projection to test and train models on different data sets.

<b>048FIMMM3</b>	<b>Financial Markets</b>	<b>6 Cr.</b>
------------------	--------------------------	--------------

This course explains the functioning of common financial instruments and their applications, defines the concept of arbitrage, discusses the principles of derivative instrument pricing and hedging of financial instruments. It covers the following four parts: mathematical finance, numerical techniques in finance, structured products, and credit risk.

<b>048GAPMM3</b>	<b>Asset-Liability Management</b>	<b>3 Cr.</b>
------------------	-----------------------------------	--------------

This course presents asset-liability management as the integration of accounting principles, asset and liability evaluation under various standards, and the analysis of their interplay. It serves as an introductory exploration of bank asset-liability management, focusing on liquidity risk and interest rate risk. Students will learn the methodology for calculating internal transfer rates and managing a balance sheet based on these rates. They will gain an understanding of ALM risk indicators and the impact on net interest margin. The course also covers the topic of risk and return on capital.

Furthermore, this course introduces fundamental concepts of corporate finance, including an understanding of different types of capital and debt from the perspective of both issuers and investors. Students will learn how to calculate the weighted average cost of capital, construct basic financial statements, and interpret financial ratios. The integration of asset-liability management and corporate finance is essential for comprehending the connections between financial structure, cost of capital, and risk. This integrated perspective enables the development of effective strategies for risk management and financial performance.

This course contributes to the development of the following competencies:

- Acquire fundamental techniques for managing the assets and liabilities of a bank.
- Examine the risks associated with liquidity and interest rates.
- Develop a comprehension of the core principles of corporate finance and acquire the skills to analyze the financial well-being of a company.

<b>048MODMM3</b>	<b>Duration Models</b>	<b>3 Cr.</b>
------------------	------------------------	--------------

This course presents the construction of experience tables for biometric risks as a key aspect of pricing and evaluating personal insurance commitments. It covers parametric, semi-parametric, and non-parametric models for right-censored and left-truncated data. The course also details the construction of mortality tables, including generational models, alternative models, and regulatory considerations.

<b>048CSRMM3</b>	<b>Modelling Insurance Losses and Ruin Theory</b>	<b>3 Cr.</b>
------------------	---	--------------

This course encompasses two major aspects: claim load modeling and ruin theory. The first part delves into individual and collective models, initially introduced in the first year of the Master's program, with a particular focus on common approximations of generating functions, including the use of Panjer's algorithm. The second part explores classical results of ruin theory, including closed-form and asymptotic formulas, ruin in continuous time—whether inventory, economic, or regulatory—as well as the concepts of the time and severity of ruin. The course also addresses advanced aspects such as reinsurance problems and optimal investment strategies, thus providing a comprehensive overview of these two fields.

<b>048PAPMM3</b>	<b>Advanced Pricing and Provisioning Practices</b>	<b>3 Cr.</b>
------------------	--	--------------

This course explores the specifics of insurance pricing, with a focus on accounting for specific risk factors and handling risk exposure. Two modeling approaches are examined: parametric and non-parametric techniques. Additionally, given the constant evolution of reserving practices, the course focuses on stochastic techniques, integrating the consideration of insurance-specific data, such as the treatment of reinsurance programs and extreme data. Particular attention is given to line-by-line reserving.

<b>048PASMM3</b>	<b>Social Protection and Health Insurance</b>	<b>2 Cr.</b>
------------------	---	--------------

This course aims to develop an understanding of the social protection system and health insurance. Social protection encompasses all collective welfare mechanisms that enable individuals to cope with the financial consequences of «social risks.» These social risks can compromise the economic security of individuals or their families, leading to a decrease in their resources or an increase in their expenses, such as old age, illness, disability, unemployment, maternity, family responsibilities, etc. Health insurance, on the other hand, is responsible for providing insurance coverage for risks related to illness, work accidents, disability, maternity, and death.

<b>048RFPMM3</b>	<b>Retirement and Pension Funds</b>	<b>2 Cr.</b>
------------------	-------------------------------------	--------------

This course addresses the description and operation of mandatory pay-as-you-go pension schemes, with a particular focus on the in-depth study of private sector employee schemes. It also examines supplementary corporate pension schemes based on capitalization, exploring the functioning of the main types of schemes. Furthermore, the objective of this course is to study and apply the evaluations of social commitments according to IAS 19 standards. It offers an overview of the regulatory environment, highlighting the social and fiscal aspects, as well as the insurance mechanisms associated with corporate pension schemes based on capitalization.

<b>048SETMM3</b>	<b>Time Series</b>	<b>2 Cr.</b>
------------------	--------------------	--------------

This course aims to present tools and concepts for studying dynamic phenomena, which evolve over time, from a statistical perspective, with the goal of modeling, estimating, and predicting. The program begins by examining the notions of stationarity and stochastic dependence, introducing tools such as spectral density, autocorrelation, and partial autocorrelation. Next, various estimation and prediction algorithms are studied. This course concludes with a review of classical time series models, including moving averages, autoregressive processes, ARMA, (S) ARIMA models, as well as conditionally heteroscedastic models such as (G)ARCH.



<b>048VECM3</b>	<b>Extreme Values and Copulas Estimation</b>	<b>3 Cr.</b>
-----------------	--	--------------

This course is divided into two parts: «Extreme Values» and «Copula Estimation.» The first part explores how to evaluate a «Value-at-Risk» associated with an extreme probability and how to estimate the individual net premium for an excess-of-loss reinsurance contract. The goal is to present probabilistic and statistical tools to address such questions, with a focus on the numerical implementation of the proposed methods. Topics covered include an introduction to extreme value theory, threshold exceedance modeling, and the evaluation of small probabilities and extreme quantiles. The second part focuses on copula estimation techniques, offering a statistical perspective complementary to the ERM course section dedicated to stochastic dependence.

<b>048CBMM4</b>	<b>Credibility and Bonus-Malus Systems</b>	<b>2 Cr.</b>
-----------------	--	--------------

This course, offered in the fourth semester of the SAF master's program, provides an introduction to Credibility Theory while exploring various topics related to actuarial science. It defines and examines the essential tools of this discipline, combining analytical and synthetic thinking to solve practical problems and develop the necessary actuarial knowledge. The term «credibility» was historically introduced to measure the reliability of relevant experiences for pricing. This course explores the multiple applications of credibility, from property insurance to life insurance, highlighting the theoretical foundations of each tool. The chapters conclude with exercises that evaluate the handling of tools and encourage critical interpretation by students. By the end of the course, students will master Bayesian credibility, Bühlmann credibility, and Bühlmann-Straub credibility, as well as differentiate and discuss each model and be able to choose the appropriate tools for pricing or estimation according to credibility theory.

<b>048CESMM4</b>	<b>Economic Behavior and Competitive Strategy</b>	<b>3 Cr.</b>
------------------	---	--------------

This course explores the standard model of the insurance market, relating insurance companies competing on prices and product characteristics with clients, whether individuals or businesses, expressing specific preferences and facing financial constraints. The simplified model assumes a total absence of information asymmetry and no behavioral biases among market agents. This course introduces the Prospect Theory of Daniel Kahneman and Amos Tversky and examines the implications of behavioral biases on the competitive strategy of insurance companies.

<b>048CABMM4</b>	<b>Insurance and Bank Accounting</b>	<b>2 Cr.</b>
------------------	--------------------------------------	--------------

This course provides a comprehensive overview of the accounting aspect in relation to financial information, with a specific focus on insurance companies. Students will have the opportunity to examine accounting positions within insurance companies, explore international accounting standards (IFRS), and gain insights into the intricacies of consolidated accounts. By the end of this course, students will develop the ability to understand and analyze the balance sheets of insurance companies and banks. They will be proficient in interpreting financial results, constructing internal accounting structures, and detecting any potential fraud or errors that may arise.

<b>048ERMMM4</b>	<b>Enterprise Risk Management</b>	<b>3 Cr.</b>
------------------	-----------------------------------	--------------

This course provides students with a comprehensive understanding of Enterprise Risk Management (ERM) fundamentals, risk measurement tools, risk transfer strategies, and the importance of stochastic dependence analysis. It equips students with the necessary knowledge to determine economic capital needs and effectively allocate capital to mitigate risks in financial and insurance sectors. The course covers the following topics:

- ERM Framework and Process: Understanding the structure and methodology of ERM, including its role in aligning risk management with organizational objectives.
- Risk Mapping: Techniques for identifying and categorizing risks to assess their potential impact on strategic goals.
- Measurement Tools: Exploring essential measurement tools in ERM, such as Value at Risk (VaR), TailVaR, and Wang-Transform, along with an examination of their properties and coherence.
- Risk Transfer Strategies: Investigating risk transfer mechanisms like reinsurance, securitization, and hedging, and their significance in managing and mitigating risks.
- Stochastic Dependence: Analyzing the interrelationships and stochastic dependencies between risks, and their implications for risk aggregation in insurance and finance.
- Economic Capital Determination: Examining the foundational principles for determining the economic capital



requirements of financial and insurance companies.

- Allocation of Economic Capital: Exploring different methods and properties involved in the allocation of economic capital within organizations.

<b>048MLRMM4</b>	<b>Lebanese and Middle Eastern Markets</b>	<b>2 Cr.</b>
------------------	--	--------------

This course familiarizes students with the insurance, reinsurance, and banking markets in Lebanon and the Middle East. It primarily aims to provide an overall view of the situation of financial institutions, insurance companies, reinsurance, and banks in the Middle East region. The ultimate goal is to introduce students to the specific dynamics of this sector within their regional environment.

<b>048MFGMM4</b>	<b>Financial Models in Insurance and Generator of Economic Scenarios</b>	<b>3 Cr.</b>
------------------	--	--------------

This course aims to demonstrate the implications of the «economic valuation» frameworks shared by prudential (Solvency II), accounting (IFRS), and financial (MCEV) standards on insurance valuation models. The transition from «marked-to-market» to «marked-to-model» logic results in specific valuation model characteristics, particularly the calculations of best estimates, which are examined in detail. The course also focuses on economic scenario generators (ESG), introducing the ESG concept and detailing the implementation process of an ESG, including projection, modeling, calibration, simulation, and result analysis. Practical cases are addressed, implementing an ESG in a simple context and its use in calculating the SCR Solo.

<b>048NEIMM4</b>	<b>European and International Standards</b>	<b>3 Cr.</b>
------------------	---	--------------

This course covers two major areas. The first part focuses on prudential banking regulation, presenting the new rules such as Basel II, Basel III, and Basel IV, with an analysis of the quantitative aspects, their impacts, and their management. The second part, complementary to the «Insurance Accounting» course, explores IFRS standards and Solvency II. This section highlights the new European solvency regime and the main international financial reporting standards used by insurance groups. The course emphasizes major developments compared to the previous framework, the principles underlying evaluations, and analyzes the impact of these standards on the management and organization of insurers.

<b>048RETMM4</b>	<b>Reinsurance, Business Case in Reinsurance, Securitization</b>	<b>3 Cr.</b>
------------------	--	--------------

This course explores in detail both proportional and non-proportional reinsurance techniques in a non-life context. A practical application complements the theoretical aspects of reinsurance through a Business Case titled «Optimization in Reinsurance,» which takes into account the Solvency II regulatory environment. This Business Case provides students with the opportunity to apply their theoretical knowledge in the field of reinsurance and adapt it to contemporary regulatory requirements.

<b>048SMAMM4</b>	<b>Actuarial Thesis</b>	<b>9 Cr.</b>
------------------	-------------------------	--------------

This internship, lasting three to four months, is offered to students in the second year of the Master's program in Actuarial and Financial Sciences. Each intern is supervised by a mentor, an executive from the company where the internship takes place. The internship topic must have a distinctly professional nature in the field of actuarial and financial sciences. At the same time, the topic must include sufficiently innovative aspects to provide the intern with interesting opportunities for academic development. At the end of the internship, students will write a final thesis and present their results before a jury.

