Syllabus

Course Description

Course Title	Financial mathematics
Course Code	27504
Course Title Additional	
Scientific-Disciplinary Sector	STAT-04/A
Language	English
Degree Course	Master in Data Analytics for Economics and Management
Other Degree Courses (Loaned)	Loaned from course 25425 - Master in Accounting and Finance (LM-77 AF)
Lecturers	Prof. Dr. Peter Alfons Schmid, PeterAlfons.Schmid@unibz.it https://www.unibz.it/en/faculties/economics-management/academic-staff/person/44766
Teaching Assistant	
Semester	First semester
Course Year/s	1
CP	6
Teaching Hours	36
Lab Hours	-
Individual Study Hours	-
Planned Office Hours	18
Contents Summary	The course provides the main mathematical concepts and techniques used in the financial industry. These are pricing of bonds, term structure determination, mechanics and pricing of derivatives (forwards, futures, swaps and options) and the use of derivatives. Thus, you learn the necessary foundations in order to attend other finance classes on the master's level.
Course Topics	Time value of money, interest rate markets and conventions, pricing of bonds, duration and convexity, interest rate term structure determination and yield spreads, mechanics of forward and future markets; determination of forward and future prices;

	interest rate and currency swaps; credit default swaps; mechanics of option markets; trading strategies involving options; binomial trees; Wiener processes; Black-Scholes-Merton model; options on stock indices, currencies, and futures; the Greek letters; volatility smile.
Keywords	Interest rates, term structure, duration, convexity, forwards, futures, swaps, options, risk-neutral valuation, binomial trees, Black-Scholes-Merton model, Greek letters, volatility smile.
Recommended Prerequisites	
Propaedeutic Courses	
Teaching Format	Frontal lectures and mini cases.
Mandatory Attendance	Recommended, but not required.
Specific Educational Objectives and Learning Outcomes	Intended Learning Outcomes (ILO) ILO 1 Knowledge and understanding: ILO 1.1 Students will develop specialised knowledge within the economic and business domains, tailored to their areas of interest and essential for addressing decision-making and managerial challenges in both public and private organisations. This learning outcome emphasises an interdisciplinary approach to problem-solving and organisational analysis. ILO 1.2 Within the Data Analytics for Economics track, students will acquire advanced knowledge in economic theory, economic analysis, and econometrics through the study of microeconomics and macroeconomics, decision theory under uncertainty, time-series analysis and forecasting techniques, and methods for causal inference using both administrative and experimental data. Additionally, students will develop competencies in data analysis, applying quantitative and computational approaches to address complex economic problems. ILO 2 Applying knowledge and understanding: ILO 2.1 Students will demonstrate the ability to analyse business-related issues that underpin data-driven decision support by applying statistical models and computational modelling techniques. This

	outcome focuses on integrating quantitative methods to evaluate and optimise organisational decision-making processes. ILO 2.2 Students will demonstrate the ability to utilise and apply models designed for market analysis and for the formulation of economic policies. This outcome emphasises the integration of theoretical and empirical approaches to support evidence-based policy development and strategic decision-making. ILO 3 Making judgements: ILO 3.1 The student acquires the ability to apply acquired knowledge to interpret data in order to make directional and operational decisions in a business context. ILO 3.2 The student acquires the ability to apply acquired knowledge to support processes related to production, management and risk promotion activities and investment choices through the organisation, analysis and interpretation of complex databases. ILO4 Communication skills: ILO 4.1 The student acquires the ability to communicate effectively in oral and written form the specialised content of the individual disciplines, using different registers, depending on the recipients and the communicative and didactic purposes, and to evaluate the formative effects of his/her communication. ILO 5 Learning skills: ILO 5.1 The student acquires knowledge of scientific research tools. He/she will also be able to make autonomous use of information technology to carry out bibliographic research and investigations both for his/her own training and for further education. Furthermore, through the curricular teaching and the activities related to the preparation of the final thesis, she will be able to acquire the ability - to identify thematic connections and to establish relationships between methods of analysis and application contexts; - to frame a new problem in a systematic manner and to implement appropriate analysis solutions; - to formulate general statistical-econometric models from the phenomena studied.

Specific Educational Objectives and Learning Outcomes (additional info.)	
Assessment	ILO 1-5: Written exams after 50% and at the end of the semester. The exams are the same for both attending and non-attending students.
Evaluation Criteria	Assessment based on mid-term (33%) and final exam (67%) or final exam only (100%) The exams are the same for both attending and non-attending students.
Required Readings	John Hull: Optionen, Futures und andere Derivate, Pearson, 11th ed, 2021.
Supplementary Readings	Selected chapters from CFA Institute Curriculum 2025 edition, Level I – III
Further Information	
Sustainable Development Goals (SDGs)	Decent work and economic growth, Responsible consumption and production, Industry, innovation and infrastructure