# Syllabus

## *Descrizione corso*

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| **Titolo insegnamento** | Financial mathematics |
| **Codice insegnamento** | 27504 |
| **Titolo aggiuntivo** | |
| **Settore Scientifico-Disciplinare** | STAT-04/A |
| **Lingua** | Inglese |
| **Corso di Studio** | Corso di laurea magistrale in Data Analytics for Economics and Management |
| **Altri Corsi di Studio (mutuati)** | Loaned from course 25425 - Master in Accounting and Finance (LM-77 AF) |
| **Docenti** | prof. dr. Peter Alfons Schmid, PeterAlfons.Schmid@unibz.it https://www.unibz.it/en/faculties/economics-management/academic-staff/person/44766 |
| **Assistente** | |
| **Semestre** | Primo semestre |
| **Anno/i di corso** | 1 |
| **CFU** | 6 |
| **Ore didattica frontale** | 36 |
| **Ore di laboratorio** | - |
| **Ore di studio individuale** | - |
| **Ore di ricevimento previste** | 18 |
| **Sintesi contenuti** | 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. |
| **Argomenti dell'insegnamento** | Time value of money, interest rate markets and conventions, pricing of bonds, duration and convexity, interest rate term |

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| | 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. |
| **Parole chiave** | Interest rates, term structure, duration, convexity, forwards, futures, swaps, options, risk-neutral valuation, binomial trees, Black-Scholes-Merton model, Greek letters, volatility smile. |
| **Prerequisiti** | |
| **Insegnamenti propedeutici** | |
| **Modalità di insegnamento** | Frontal lectures and mini cases. |
| **Obbligo di frequenza** | Recommended, but not required. |
| **Obiettivi formativi specifici e risultati di apprendimento attesi** | Intended Learning Outcomes (ILO)<br><br>ILO 1 Knowledge and understanding:<br>ILO 1.1<br>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.<br>ILO 1.2<br>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.<br><br>ILO 2 Applying knowledge and understanding:<br>ILO 2.1<br>Students will demonstrate the ability to analyse business-related |

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| | 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.<br>ILO 2.2<br>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.<br><br>ILO 3 Making judgements:<br>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.<br>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.<br><br>ILO4 Communication skills:<br>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.<br><br>ILO 5 Learning skills:<br>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<br>- to identify thematic connections and to establish relationships between methods of analysis and application contexts;<br>- to frame a new problem in a systematic manner and to implement appropriate analysis solutions; |

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| | - to formulate general statistical-econometric models from the phenomena studied. |
| **Obiettivi formativi specifici e risultati di apprendimento attesi (ulteriori info.)** | |
| **Modalità di esame** | ILO 1-5: Written exams after 50% and at the end of the semester.<br><br>The exams are the same for both attending and non-attending students. |
| **Criteri di valutazione** | Assessment based on mid-term (33%) and final exam (67%) or final exam only (100%)<br><br>The exams are the same for both attending and non-attending students. |
| **Bibliografia obbligatoria** | John Hull: Optionen, Futures und andere Derivate, Pearson, 11th ed, 2021. |
| **Bibliografia facoltativa** | Selected chapters from CFA Institute Curriculum 2025 edition, Level I – III |
| **Altre informazioni** | |
| **Obiettivi di Sviluppo Sostenibile (SDGs)** | Buona occupazione e crescita economica, Utilizzo responsabile delle risorse, Innovazione e infrastrutture |