Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

# Syllabus

## *Kursbeschreibung*

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| **Titel der Lehrveranstaltung** | Statistik |
| **Code der Lehrveranstaltung** | 27010 |
| **Zusätzlicher Titel der Lehrveranstaltung** | |
| **Wissenschaftlich-disziplinärer Bereich** | STAT-01/A |
| **Sprache** | Italienisch |
| **Studiengang** | Bachelor in Wirtschaftswissenschaften und Betriebsführung |
| **Andere Studiengänge (gem. Lehrveranstaltung)** | |
| **Dozenten/Dozentinnen** | Prof. Davide Ferrari,<br>Davide.Ferrari2@unibz.it<br>https://www.unibz.it/en/faculties/economics-management/academic-staff/person/39001<br>dr. Giulia Bertagnolli,<br>Giulia.Bertagnolli@unibz.it<br>https://www.unibz.it/en/faculties/economics-management/academic-staff/person/49312 |
| **Wissensch. Mitarbeiter/Mitarbeiterin** | Dott. Norman Fidelis Romano Maria Fauster |
| **Semester** | Erstes Semester |
| **Studienjahr/e** | 2 |
| **KP** | 6 |
| **Vorlesungsstunden** | 36 |
| **Laboratoriumsstunden** | 18 |
| **Stunden für individuelles Studium** | - |
| **Vorgesehene Sprechzeiten** | 18 |
| **Inhaltsangabe** | The course introduces the fundamental concepts of descriptive statistics, probability and statistical inference. Students learn how to classify data, construct graphical and numerical summaries and |

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| | analyse relationships through correlation and regression.<br><br>The section on probability covers random variables, discrete and continuous distributions, conditional probability and the Central Limit Theorem. The section on inference develops the logic of estimation and hypothesis testing for means, variances and proportions. Emphasis is placed on understanding statistical reasoning and applying the methods to socio-economic data using R. |
| **Themen der Lehrveranstaltung** | 1) Probability: Sample spaces, events and axioms of probability. Conditional probability and independence. Total probability theorem and Bayes' theorem.<br>2) Discrete Distributions: Random variables and probability mass functions. Expected value and variance. Main families: Bernoulli, Binomial, Geometric, Poisson.<br>3) Continuous Distributions: Density functions and distribution functions. Expected value and variance. Main families: Uniform, Normal, Exponential, Chi-square, Student's t.<br>4) Distributions of Random Variable Functions: Linear combinations of random variables. Sample distributions of mean, variance and proportion. Central Limit Theorem.<br>5) Point Estimation: Statistics and Estimators. Properties of estimators: correctness, consistency, efficiency. Estimation methods: method of moments, maximum likelihood.<br>6) Estimation by Intervals: Confidence intervals for mean, variance and proportion. Choice of sample size.<br>7) Testing Statistical Hypotheses: Concepts of hypothesis testing: test statistics, type I and type II errors, p-value. Tests for mean and proportion (one-sample and two-sample). Chi-square tests: variance, fit, independence.<br>8) Applications in R: Descriptive analysis and graphical representations. Probability models and simulations. Estimation, confidence intervals and hypothesis tests. Applications to socio-economic data. |
| **Stichwörter** | Probability, Distributions, Estimation, Inference |
| **Empfohlene Voraussetzungen** | |
| **Propädeutische Lehrveranstaltungen** | |

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| **Unterrichtsform** | The course combines lectures with problem-solving sessions and guided exercises. Lectures introduce the theoretical concepts of probability, distributions, estimation and inference, while exercises focus on applied problem-solving and statistical reasoning practice. Selected topics are implemented using the statistical software R, with demonstrations and practical examples to consolidate both the theoretical and applied aspects of the course. |
| **Anwesenheitspflicht** | Attendance not compulsory, but recommended |
| **Spezifische Bildungsziele und erwartete Lernergebnisse** | Knowledge and understanding<br>Area: quantitative methods for decision-making<br>knowledge of basic and intermediate level mathematical tools for understanding and analysing economic mechanisms through theoretical models and empirical applications<br>knowledge of the tools for static, dynamic, and comparative analysis of data on individuals, firms and economies<br>knowledge and understanding of descriptive statistics, the fundamentals of probability theory and sample methods, standard distributions and their application to economic analysis as well as linear and non-linear regression<br>understanding of parametric estimation and hypothesis testing<br>Knowledge of computer tools necessary for reading and analysing economic data and models<br>knowledge of the structure of computer networks, their main applications and security techniques as well as techniques for data collection, presentation and analysis using appropriate software<br>knowledge of international accounting systems and the double-entry method for the recognition and measurement of business operations<br>"understanding of financial statements<br>"<br>"in-depth knowledge of accounting data recognition or management control<br>"<br>Knowledge of the analysis method for estimating present values and discount factors for estimating the cost of capital and valuation of bonds and shares<br>Knowledge of medium and long-term financial forecasting methodologies and sensitivity analysis with simulation under uncertainty to manage risks in corporate and international finance |

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| | knowledge and understanding of the international financial environment, multinational risk defence techniques and competitive strategies adopted by global banks<br>knowledge of the mechanisms underlying effective communication of quantitative topics in three languages: Italian, German and English<br><br>"Ability to apply knowledge and understanding<br>"<br>Area: quantitative methods for decision-making<br>to be able to analyse (unconstrained) optimisation problems and to mathematically interpret models of social and economic dynamics<br>to formalise economic problems using mathematical models, to solve such problems and to interpret the results conceptually<br>being able to analyse economic data using descriptive statics, parametric and non-parametric methods as well as linear and non-linear regression and interpret the results<br>knowing how to apply international accounting standards to the various contexts of business reality<br>knowing how to derive and interpret economic information taken from the web<br>knowing how to use computers and computer networks to analyse large quantities of data in solving complex problems and to write theses and articles<br>knowing how to evaluate fixed-income and equity financial instruments of companies listed on stock markets through the use of spreadsheet programs<br>knowing how to analyse financial statements by means of balance sheet ratios and communicate the results in accordance with international professional standards<br>being able to apply the main theories on capital, foreign exchange and commodity markets to actually observed data, also in an international context<br>knowing how to set up and carry out an empirical project using econometric software and financial or economic databases<br>knowing how to use techniques for evaluating the performance of financial investments and understanding the price formation mechanisms of risky financial assets and spot and forward interest rates<br>knowing how to work with basic and intermediate level |

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| | mathematical tools, and basic level statistics, to study the behaviour of economic actors, from a theoretical and empirical point of view<br>knowing how to analyse economic datasets using spreadsheets or other suitable software<br>knowing how to use computer tools for the analysis of economies<br>being able to communicate the results of quantitative analyses prepared according to international professional standards in three languages: Italian, German and English<br><br>Autonomy of judgement<br>choose the most appropriate quantitative and qualitative methods of analysis<br>find the necessary information in databases, legal sources and scientific literature<br>use logical reasoning to combine information and analytical methods, also using modern software packages, to arrive at a solution<br><br>Learning skills<br>retrieve information from databases, scientific literature, laws and regulations as required in professional life<br>analyse, critically process and integrate data, information and future experience, also using advanced software packages |
| **Spezifisches Bildungsziel und erwartete Lernergebnisse (zusätzliche Informationen)** | |
| **Art der Prüfung** | The assessment consists of three parts:<br>1) Four homework assignments during the semester worth 20% of the final grade.<br>2) One midterm written examination worth 30% of the final grade.<br>3) A final written examination worth 50% of the final grade.<br><br>The intermediate and final examinations are based on a series of problems designed to assess knowledge and understanding of statistical tools and their correct use. The final examination is worth 100% of the final grade for students who choose not to take point 1) or 2). |

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| **Bewertungskriterien** | Assessment will be based on the student's ability to demonstrate both theoretical understanding and practical application of statistical methods. In written examinations, emphasis will be placed on clarity and correctness of reasoning, appropriate use of formulae and statistical terminology, and accurate interpretation of results. Homework will be graded on completeness, correctness and clarity of exposition, with the aim of fostering continuous learning throughout the semester. To pass the course, students will need to achieve a positive overall grade, demonstrating competence in descriptive analysis, probability, estimation and hypothesis testing, as well as the correct use of R software for data analysis. |
| **Pflichtliteratur** | Hogg, R. V., Tanis, E. A., & Zimmerman, D. L. (2020).<br>Probability and Statistical Inference (10th ed.). Pearson.<br>ISBN: 9780135189399. |
| **Weiterführende Literatur** | Newbold, P., Carlson, W. L., & Thorne, B. M. (2022).<br>Statistics for Business and Economics (10th ed., Global<br>Edition). Pearson Education. ISBN 978-1292436845<br>Italian Translation: Newbold, P., Carlson, W. L., &<br>Thorne, B. M. (2021). Statistica. Ediz. MyLab (9ª ed.).<br>Pearson. ISBN 978-8891910653 |
| **Weitere Informationen** | |
| **Ziele für nachhaltige Entwicklung (SDGs)** | Keine Armut, Partnerschaften zur Erreichung der Ziele, Gesundheit und Wohlergehen, Hochwertige Bildung, Geschlechter-Gleichheit, Sauberes Wasser und Sanitär-Einrichtungen, Bezahlbare und saubere Energie, Menschenwürdige Arbeit und Wirtschaftswachstum, Industrie, Innovation und Infrastruktur, Weniger Ungleichheiten, Nachhaltige Städte und Gemeinden, Nachhaltiger Konsum und Produktion, Maßnahmen zum Klimaschutz, Leben unter Wasser, Leben an Land, Frieden, Gerechtigkeit und starke Institutionen, Kein Hunger |