Syllabus

Course Description

Course Title	Statistics for PPE
Course Code	27055
Course Title Additional	
Scientific-Disciplinary Sector	STAT-01/A
Language	Italian
Degree Course	Bachelor in Economics, Politics and Ethics
Other Degree Courses (Loaned)	
Lecturers	Prof. Francesca Marta Lilja Di Lascio, Marta.DiLascio@unibz.it https://www.unibz.it/en/faculties/economics-management/academic-staff/person/32845 Dott. Marta Nai Ruscone, Marta.NaiRuscone@unibz.it https://www.unibz.it/en/faculties/economics-management/academic-staff/person/39746
Teaching Assistant	
Semester	First semester
Course Year/s	2
CP	8
Teaching Hours	48
Lab Hours	24
Individual Study Hours	-
Planned Office Hours	24
Contents Summary	The course refers to the typical educational activities of the scientific area of Statistic-Mathematic. The course aims to provide students with the basic concepts of descriptive statistics, probability, statistical inference and linear regression model, with applications in economics and social sciences. Throughout the course, R software will be used to perform

	statistical analysis of real or simulated data.
Course Topics	Descriptive Statistics Preliminary definitions. The classification of variables. Frequency distributions. Graphical representations. Descriptive analysis of the data through measures of central tendency and variability. Probability Random outcomes and events. Probability: definitions and axioms. Conditional probability and independence. Total probability theorem. Bayes' theorem. Discrete and continuous random variables. Probability function and probability density function. Expected value and variance. Linear combination of random variables. Standardized variables. Some distributions for discrete random variables: uniform, Bernoulli, binomial and Poisson. Some distributions for continuous random variables: Gaussian, Student, Chi-square. Central limit theorem. Statistical Inference Inductive process under uncertainty. Sampling and sampling distributions of the mean, variance and proportion. Statistics, estimators and their properties. Point estimation. Confidence intervals for the mean, the variance and the proportion. Hypothesis testing. Type I error and type II error. Significance level and p-value. Hypothesis tests for a mean and for a proportion. Correlation, dependence and statistical models Analysis of two-way tables and association measures. Chi-squared test of independence. Bivariate analysis through correlation and regression. Inference for simple linear regression. R software Introduction to R. Descriptive data analysis. Basic of probability and statistical inference. Linear regression model.
Keywords	Data analysis, Descriptive statistics, Probability, Inferential statistics, R software
Recommended Prerequisites	Basic math concepts, e.g., functions, equations, limits, etc., and basic computer skills.
Propaedeutic Courses	Not foreseen but it is highly recommended both the Preparatory course in Mathematics and Mathematics for EPE.

Teaching Format	Frontal lectures, exercises, computer labs.
Mandatory Attendance	Highly recommended, but not required.
Specific Educational Objectives and Learning Outcomes	At the end of the course, students will have acquired the following knowledge and understanding: - knowledge of mathematical techniques for solving optimisation problems; - knowledge of probabilistic and inferential tools that allow the use of statistical models; - ability to model social and economic phenomena; - ability to give an economic interpretation to the results of different mathematical-statistical models applied to economics; - basic knowledge of data management and computer programming for the statistical and econometric analysis of socio-economic data; - knowledge of the technical vocabulary of the subjects taught in this area of learning. Applying knowledge and understanding: - ability to construct and verify simple statistical and econometric models; - ability to address issues of statistical inference, estimate parameters of probabilistic and statistical models, and perform statistical tests; - ability to use quantitative methods to solve economic problems; - ability to read, write, and communicate in the technical language of quantitative methods in the three official languages of instruction. Independent judgement: Acquisition of judgement skills and methodological tools useful for the critical analysis of data, sources, assumptions and implications of scientific practice, and of the political, ethical and legal context within which economic phenomena occur and interact. Communication skills: Proficiency (oral and written) in Italian, German and English, including translation between these languages. Intercultural competence. Conceptual clarity, ability to synthesise and write,

	particularly with regard to the preparation of scientific or science-based documents. Learning skills: Promotion of critical thinking and analytical skills that enable students to focus on complex problems in their long-term dynamics and in the variety of their implications, including ethical ones.
Specific Educational Objectives and Learning Outcomes (additional info.)	Knowledge and understanding: - Knowledge and understanding of descriptive statistics for univariate and bivariate data. - Knowledge and understanding of basic probability theory. - Knowledge and understanding of the logical reasoning underlying the construction of a sampling distribution and the implications for statistical inference. - Knowledge of the basic vocabulary of statistics. - Understanding basic statistical models. - Understanding the philosophy and scientific principles underlying the hypothesis testing. Applying knowledge and understanding: - Ability to use quantitative methods to describe economic and social phenomena. - Ability to read, write and communicate in the technical language of statistics. - Ability to perform basic data collection and statistical data analysis by means of the R software. - Ability to use statistical inference and the linear regression model in applications to economics and social sciences. - Ability to carry out hypothesis tests for a variety of statistical problems. Making judgments: ability to make decisions on models and tools for statistical analysis. Communication skills: ability to present in a concise way a statistical analysis. Learning skills: Ability to establish links among different statistical models.

Assessment	Written exam on statistical theory (exercises and theoretical questions) and written exam on the statistical software R (questions on the code and interpretation of the outputs). A voluntary midterm and obligatory final exam, both written. The midterm grade can be reject in which case you will take the full final exam. For the midterm and final exam neither textbooks, nor other teaching materials, nor any electronic devices are allowed in the examination room. Dictionaries without notes, simple calculators, and an A4 paper reporting only formulas are permitted. The assessment method indicated is valid for both attending and non-attending students.
Evaluation Criteria	The final grade will be a weighted average of the written midterm exam (50%) and the written final exam (50%). Students who do not take the midterm or reject their midterm grade will be given a longer exam that will count for 100% of the final grade. In the midterm, the final, and the full exam, 70% of the grade will be for statistical theory and exercises and 30% for software R. Criteria for written exam of theory and exercises: correctness and clarity of answers. Criteria for the part on software R: the ability to interpret outputs and to correctly write formal code.
Required Readings	- S. Borra, A. Di Ciaccio, Statistica – metodologie per le scienze economiche e sociali, McGraw-Hill, Milano, 2020, IV Ed.. ISBN: 978-88-386-9632-9. Chapters: 1-4, 6, 8-16. - F. Ieva, A.M. Paganoni, V. Vitelli, Laboratorio di Statistica con R. Eserciziario, Pearson, Milano, 2012. ISBN: 978-88-719-2762-6. - Lecture notes, R code of the labs and exercises.
Supplementary Readings	- A. Agresti, B. Finlay, Metodi statistici di base e avanzati per le scienze sociali, Pearson, Milano, 2012. ISBN: 978-88-7192-945-3. - G. Espa, R. Micciolo, Problemi ed esperimenti di statistica con R, Apogeo, Milano, 2014. ISBN: 978-88-387-8610-5.
Further Information	
Sustainable Development Goals (SDGs)	Partnerships fot the goals, Quality education