

Syllabus
Course description

Course title	Introduction to Data Management and Data Analysis
Course code	27601
Scientific sector	SECS-S01
Degree	LM-63 Public Policy and Innovative Governance
Semester and academic year	a.y. 2024/2025 Semester: 1. Semester
Year	1
Credits	8
Modular	No
Total lecturing hours	48
Total lab hours	0
Total exercise hours	6
Attendance	suggested, but not required
Prerequisites	<p>B1 level in English is required to sit the exam.</p> <p>Students without a background in statistics are strongly recommended to attend the <i>Preparatory Course</i> in Statistics scheduled at the beginning of the first semester. At the end of the <i>Preparatory Course</i>, students are encouraged to take a test to assess the basic requirements to access Statistics for the Public Sector.</p> <p>Students receiving a “not passed” grade in the preparatory course will be put in contact with the main lecturer to bridge existing knowledge gaps.</p> <p>Students receiving a “pass with distinction” grade in the preparatory course will be awarded an additional point for the final mark in Introduction to Data Management and Data Analysis.</p>
Course page	https://www.unibz.it/en/faculties/economics-management/master-public-policy-innovative-governance/course-offering/?academicYear=2024
Specific educational objectives	<p>The course refers to the typical educational activities and belongs to the Economic and Statistical Sciences (sector SECS-S01).</p> <p>The course is designed to acquire further computer skills.</p> <p>Emphasizing practical skills, the course covers data</p>

	<p>collection and survey methods, data visualization and data analysis in the R computing environment. Students will learn to handle real-world data commonly generated by public administrations and use statistical and machine learning tools to derive insights relevant to policy-making. The course focuses on the interpretation of results to inform decision-making within the public sector focusing on the importance of data-driven insights for effective governance.</p> <p>By the end of the course students will become familiar with basic data analysis tools applied in the realm of public administration and learn how to produce reports containing statistical results, enhancing their ability to communicate, make informed decisions within the public administrations and contribute meaningfully to evidence-based policymaking.</p>
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Lecturer	<p>Prof. Steven Stillman (24 lect., 3 exercise hours) https://www.unibz.it/en/faculties/economics-management/academic-staff/person/36390-steven-stillman TBA (24 lect.) TBA (3 exercise hours)</p>
Scientific sector of the lecturer	<p>SECS-P/03 (Prof. Stillman) SECS-S/01 (TBA)</p>
Teaching language	English
Office hours	24
Lecturing assistant	TBA
Teaching assistant	//
Office hours	//
List of topics covered	Data Types in the Public Sector; Data Management Fundamentals; Introduction to R Programming; Data Visualization; Survey Methods and Analysis
Course Outline	<p>1. Common Data Types in the Public Sector: Overview of data in public policy and governance. Types of data: quantitative data versus qualitative data. Data sources. Introduction to data collection and surveys.</p> <p>2. Data Management Fundamentals: Data collection and data quality. Data cleaning and pre-</p>

	<p>processing. Introduction to data storage and databases.</p> <p>3. Introduction to R Programming: Basics of R: Installation, IDEs, basic operations. Data structures in R (vectors, matrices, data frames). Basic data manipulation in R.</p> <p>4. Data Visualization: Principles of effective data visualization. Introduction to ggplot2 in R. Creating graphs and charts for policy analysis</p> <p>5. Survey Methods and Analysis: Designing surveys for public policy research. Sampling techniques and sources of bias. Analyzing survey data in R.</p> <p>6. Introduction to Machine Learning and Statistical Learning Methods in Public Policy. Overview of machine learning and its applications in public policy. Supervised vs. unsupervised learning. Basic statistical learning models in R.</p>
<p>Teaching format</p>	<p>The course will combine in-class explanations of data-analysis procedures, problem-solving and discussion of case studies. Students will be encouraged to participate actively in class work, which will give them the opportunity to develop their problem-solving skills in the context of realistic situations.</p>
<p>Learning outcomes</p>	<p>1. Knowledge and Understanding: Develop a basic understanding of statistical methods in the context of data management, visualization and analysis within the public administration. Acquire knowledge of various data collection methods used in the analysis of real-world data.</p> <p>2. Applying Knowledge and Understanding: Apply acquired knowledge to handle and manipulate diverse datasets commonly encountered in public administration, showcasing practical skills in data manipulation. Apply statistical and machine learning tools in the R computing environment to extract</p>

meaningful information from complex datasets.

3. Making Judgments: Develop the ability to interpret results derived from statistical analyses, emphasizing the importance of informed decision-making within the public sector. Assess the appropriateness and limitations of statistical procedures, fostering a discerning approach to the use of data in policy formulation.

4. Communication Skills: Enhance communication skills by producing reports containing statistical results, ensuring the effective presentation of complex findings within public administrations. Develop the capacity to convey data-driven insights in an accessible manner, facilitating understanding and informed decision-making among individuals with varied backgrounds.

5. Learning Skills: Develop a continuous learning mindset in the field of data analysis by becoming familiar with basic data analysis tools applied in public administration, preparing students to adapt to evolving statistical and data science methodologies. Equip students with the skills to independently answer questions using statistical and data scientific tools, fostering self-directed learning and adaptability in the rapidly changing field of data management within public administration.

Assessment

For Attending Students:

- **Mid-Term Exam (40%):** Part A (20%) consists of multiple-choice and short-answer questions to assess understanding of course material, and Part B (20%) focused on the practical application of R code to a given dataset or statistical problem.
- **Final Exam (60%):** The exam will consist of review questions designed to test students' understanding of the course material excluding contents asked in the midterm. Questions will range from theoretical knowledge to application-based scenarios that require critical thinking and synthesis of learned concepts.

For Non-Attending Students:

	<ul style="list-style-type: none"> • Written Exam (100%): Non-attending students will take a more extensive written exam covering the course material in full. Part A (50%) consists of multiple-choice and short-answer questions to assess understanding of course material, and Part B (50%) focused on the practical application of R code to a given dataset or statistical problem. <p><i>Midterm results are valid for 1 academic year and cannot be carried over beyond that time-frame.</i></p>
Assesment language	English
Evaluation criteria and criteria for awarding marks	<p>Written Exam: Correct procedure and solution counts; ability to summarize, evaluate, and establish relationships between topics, and critical thinking.</p> <p>R Code: Correctness of Code, Efficiency and Structure of Code; Quality of Visualization; Interpretation</p>
Required readings	James, Witten, Hastie and Tibshirani. 2015. An Introduction to Statistical Learning with Applications in R. Springer Science. Available for free here: https://www.statlearning.com/
Supplementary readings	<p>Newbold, Paul, William L. Carlson, and Betty M. Thorne. <i>Statistics for business and economics</i>. Pearson, 2013.</p> <p>Class notes and practical case studies will be made available by the lecturer during the semester.</p>