UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Statistica

2627-1-E1602N007

Learning objectives

The course has a primarily methodological focus. integrated by practical excecises and applications. The course aims to achieve the following objectives:

Knowledge and Understanding
To introduce students to statistical reasoning and the basic statistical methods used for data collection and for transforming data into information useful for decision-making and for producing empirical evidence to support the analysis of social phenomena.

Ability to Apply Knowledge and Understanding
To introduce both the theoretical and practical aspects of the fundamental elements of univariate and bivariate descriptive statistics and classical statistical inference; to formally integrate and contextualize data analysis tools and techniques that students may have already encountered during their school and university studies; and to introduce new basic statistical tools for both descriptive and inferential purposes.

Independent Judgment
To foster critical statistical reasoning both in the production of statistical information and in the role of users who receive data-based statistical and quantitative information, with attention to data sources, data quality, and the validity of generalizations.

Communication Skills
To refine students' skills in oral, written, and infographic communication, as well as their ability to critically interpret quantitative information based on data.

Learning Skills
To encourage openness, curiosity, and a critical approach to understanding the nature and quality of data, their sources, and the statistical tools appropriate for extracting new knowledge from such data, with particular reference to data collected in social settings.

Contents

The course offers an introduction to the formal principles of modern statistical reasoning, the basic tools of univariate and bivariate descriptive statistics, and the foundational methods of classic inferential statistics.

Practical applications are addressed through hands-on exercises integrated with the course.

Throughout the course, online tools will be provided via the e-learning platform to support student–instructor interaction and autonomous learning, including self-guided exercises, weekly quizzes, and self-assessments (see the “Teaching Methods” section for details).

Detailed program

Elements of univariate descriptive statistics:
Population, unit, statistical phenomenon and its modalities; observation of a statistical phenomenon (data collection) and frequency distributions; measures of central tendency and measures of variability, basic analysis of time series data.

Elements of bivariate descriptive statistics:
Joint observation of a pair of statistical phenomena and two-way tables; statistical independence, detection and measurement of connection, dependence, and correlation; introduction to simple regression and the regression line.

Elements of statistical inference:
Sampling, sampling variability and sampling errors; review of probability calculus; point estimation for the mean, variance, and proportion; properties of an estimator, mean squared error, and standard error; confidence intervals for the mean and for the proportion—exact for Normal populations and approximate for large samples; introduction to statistical tests—Z and T tests for the mean and proportion, exact for Normal populations and approximate for large samples; Chi-square test of independence (approximate for large samples) for bivariate data.

A detailed examination syllabus (with references to the adopted textbook) will be made available on the e-learning webpage at the end of the course (December 2026) and will remain valid for all exam sessions in the academic year 2026/27.

Prerequisites

Recommended prerequisite: Mathematics for Social Sciences
It is strongly recommended that students acquire the following elements of basic mathematics:

- Sets and cardinality (finite, countable, continuum cardinality);
- Real intervals;
- Solutions of simple first-degree parametric equations;
- Definition of a (real) function and its values;
- Equation of a straight line;
- Minimum/Maximum of a real-valued function.

Teaching methods

28 lectures, delivered primarily **in person (80%)** and partly **online (approximately 20%)**, in Italian, using slides and web-based materials.

Each lecture is structured as follows: **70% DE**: presentation of concepts, definitions, and statistical methods.
30% DI: examples and exercises, discussions based on pre-assigned materials, Internet-based research activities, learning assessment quizzes (weekly tests), and optional self-assessment test available online.

Additional in-person tutorial classes accompany the course, in Italian, composed of: 50% DE, supported by slides and ** and
50% DI including online quizzes designed to support examination preparation.

Throughout the course, the e-learning platform (http://elearning.unimib.it) is regularly updated with teaching materials, online learning resources, and tools to support interaction between instructors and students. In particular, the “Introduction” and “Lectures” sections of the e-learning page include:

- A Q&A discussion forum and an anonymous online board for questions, comments, and concerns;
- Advance outlines of the topics to be covered during the week’s lectures;
- Slides from completed lectures
- Videorecording of completed lectures (restricted access, see session "Lectures"
  The “Additional Online Teaching Materials” section includes:
- Weekly open-access tests: untimed multiple-choice quizzes covering topics taught during the previous week.
- Self-assessment tests: untimed, single-attempt multiple-choice quizzes, to be completed independently and voluntarily, each covering a limited portion of the course syllabus. 4 self-assessment tests are made available during the course, following the completion of lectures and tutorials related to each section of the program.
  Students are strongly encouraged to complete the weekly tests and self-assessment exercises during the course to enhance learning outcomes.At the end of the course, the self-assessment tests will be **reopened for final examination preparation**, with no time limits and two attempts allowed for each test.

Assessment methods

Written exam for all exam sessions of the academic year 2026/27
An online quiz (administered in person in the computer lab) consisting of both numerical exercises (multiple-choice) and theoretical questions (open-ended), covering all topics listed in the syllabus published on the e-learning page at the end of the course.
The numerical exercises aim to assess the student's ability to: understand the data provided,
interpret the question and identify the appropriate statistical tool, correctly apply the tool to the data (performing simple calculations with a calculator), and clearly communicate and correctly interpret the resulting number/indicator.
The open-ended theoretical questions allow for teacher–student interaction and aim to assess the student's ability to: understand the statistical question, place it within the appropriate formal framework according to the relevant statistical tool and objective (univariate descriptive, bivariate descriptive, inferential), and explain the method effectively and with sufficient rigor.
The written exam normally lasts 1 hour and 30 minutes. Withdrawal from the exam is possible at any time during the session.

If the written exam receives a passing grade (at least 18 out of 30), students may **optionally request an oral exam** on the entire course syllabus to improve their final grade. This is subject to the student’s explicit request,

refusal of the written exam grade, and registration for the oral exam.

Simplified exam – with restricted access to students who successfully completed all 4 intermediate online assessments during the course (October–December 2025), with a sufficient average grade. This option is **limited** to one of the two winter sessions (January or February 2026).
The simplified exam consists of an online quiz with 4 open-ended theoretical questions covering the entire syllabus published on the e-learning page at the end of the course. These open questions allow for teacher–student interaction and aim to assess the student's ability to: understand the statistical question, place it within the correct formal context in relation to the statistical tools and goals (univariate, bivariate, or inferential), and clearly and rigorously explain the relevant method.

The simplified exam typically lasts 30 minutes and is held in person (in the computer lab) on the official date and time of the regular written exam.

Textbooks and Reading Materials

In Italian

F. Mecatti, "Statistica di Base. Come, quando e perché". McGraw-Hill, III ed. (2022);

L. Pagani, "Complementi ed esercizi di statistica descrittiva ed inferenziale " Amon (2022);

Additional digital tools and materials at http://elearning.unimib.it (see previous section Teaching methods**)

English textbooks and additional digital resources will be advised on demand and/or according to specific needs

Sustainable Development Goals

NO POVERTY | GOOD HEALTH AND WELL-BEING | GENDER EQUALITY | DECENT WORK AND ECONOMIC GROWTH | REDUCED INEQUALITIES