UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

# COURSE SYLLABUS

# Statistics

**2425-2-E4001N085**

## Learning objectives

The course is mainly methodological and aims at the following purposes:

a) to introduce students to statistical reasoning and basic statistical tools for the collection and sourcing of data and for the extraction from data of new knowledge useful to decision-making and to produce empirical evidence to support the analysis of societies.

b) to introduce the basics of both univariate and bivariate Descriptive Statistics; to introduce the basics of Statistical Inference; to unify and formally reallocate methods and techniques of data analysis which the students might have already met in previous school/university courses; to provide new statistical tools with both descriptive and inferential purposes.

## Contents

The course offers an introduction to the formal principles of the modern statistical reasoning, from the basics of descriptive statistics to the basic instruments of statistical inference.

Applications are covered through exercise classes supplementing the main theoretical course.

During the course online tools are offered, posted on the elarning page, for self-practice and intermediate partial quiz that can be valid for the final exam (see section Teaching methods below)

## Detailed program

- Basics of univariate Descriptive Stats: statistical population & unit, statistical variable and its values; (complete) data collection, frequency distributions; mean values and measure of variability.

- Basics of bivariate Descriptive Stats: joint (complete) data collection of a pair of statistical variables and two-way table; independence; concept and measure of (global) association, dependence and (linear) correlation; introduction to regression and linear (bi-variate) model.

- Basics of Statistical Inference: sampling, sample variability and sampling error; essential elements of probability; point estimate and estimators for the population mean and percentage (relative frequency); estimator's properties, Mean Squared Error and Standard Error; Confidence Interval for the population mean and percentage (relative frequency), exact for Normal population and approximated for Large Sample; (Significance) Test Z and T for null hypotheses on the population mean and percentage (relative frequency), Independence Chi Square Test for contingency table.

***At the time of ending of classes (December 2024) the detailed program (with references to the textbook) will be available on line. It will remain valid for all the exams of the academic year 2024/25***

## Prerequisites

**Credits from Mathematics for Social Sciences are strongly suggested.

Sets and their cardinality (finite, countable and uncountable); real intervals; simple linear parametric equations; (real) function and its values; polynomials and the slope-intercept line; minimum of a real function.

## Teaching methods

90% dispensive teaching with frontal lessons and slides
10% interactive teaching with assessment quiz (weekli test) and optional path of online partial midterm tests
Further exercises class
Additional exercise classes attached to the course composed of 50% dispensational teaching using slides and 50% interactive teaching with online quiz in preparation for the final exam (online in computer lab)

Additional material posted on the elearning page includes forum online and slides of all classes (theory and exercises)

Interactive teaching includes:
**Weekly Tests** as multiple-choices quiz online, with unlimited time, covering the topics of previous week classes. All weekly tests completed and marked “sufficient” (at least 50% correct answers, 2 trials) allow access to the Intermediate Assessments.

**Partial Midterm Tests**
as multiple-choice limited time Quiz online, covering a limited part of the course’s program, to be carried out autonomously and optionally for anyone enrolled in the elearning page .
4 quizzes are posted on the elearning page during the semester, at the end of classes covering “that” program part.
Date and time of each of the 4 Intermediate Assessments are notified though the elearning page.
The 4 Intermediate Assessments can partially replace the written final exam and give access to a “simplified exam” according to the following rules:

1. Access to each Intermediate Assessment is allowed exclusively in case of all weekly tests completed and “sufficient”;
2. In case of all 4 Intermediate Assessments completed and “sufficient” on average, they replace the “regular written exam” and give access to a “simplified exam” at one of the summer finals of your choice (Jenuary or February)

Access and evaluation rules for the Intermediate Assessments are detailed on the elearning page at the beginning of 1st semester.
For further info about both the regular written exam and the “simplified exam”, see section Assessment Methods here below.

## Assessment methods

**(regular) Written Exam:**
online test, with both numerical exercises (multiple choice) and theoretical (open) questions covering all topics in the program published on the elearning page at the end of classes.

Duration of the written test: 1h 30m Withdrawal allowed anytime.

Optional Oral interview, covering the entire program, provided on demand and upon a positive score in the written test.

**Simplified Exam**
Access **allowed axclusively** upon all 4 Intermediate Assessments completed during the course (October-December 2024) and scored "sufficient" on average.
**Limited** to January or February 2025.
In-person Quiz online, 30min, 4 theoretical open questions covering the entire porgram published on the elearning page.

## 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 | ZERO HUNGER | GOOD HEALTH AND WELL-BEING | GENDER EQUALITY | CLEAN WATER AND SANITATION | AFFORDABLE AND CLEAN ENERGY | DECENT WORK AND ECONOMIC GROWTH |

INDUSTRY, INNOVATION AND INFRASTRUCTURE | REDUCED INEQUALITIES | SUSTAINABLE CITIES AND COMMUNITIES | RESPONSIBLE CONSUMPTION AND PRODUCTION | CLIMATE ACTION | LIFE BELOW WATER | LIFE ON LAND | PEACE, JUSTICE AND STRONG INSTITUTIONS