# Statistics

## Professor Luca Bagnato

***COURSE AIMS AND LEARNING OUTCOMES***

The course introduces the students to the basic concepts and methods for statistical data analysis. The aim is to provide essential understanding of statistical techniques used to support modern business decision making and economic data modelling. The course provide a preparation for more advanced statistical techniques students will face during the rest of their degree course.

***Learning outcomes.*** At the end of the course students should be able to analyze data, individuating proper methods to summarize data and deal with problems in statistical inference such as point inference and hypothesis testing. They should also be able to read and understand research reports based on statistical data analysis.

***COURSE CONTENT***

Part I: Descriptive statistics

*Introduction*. Tabulation and graphical representations. Histograms.

*Means.* Main Means and their properties. Median and Mode.

*Variability.* Variance and its properties. Coefficient of variation, absolute deviation from the median.

*Concentration.* Lorenz curve. Gini coefficient. Absolute Mean Difference.

*Bivariate descriptive statistics.* Covariance and its properties. Linear Correlation. Least Squares.

Part II: Probability theory

*Introduction*

*Theory of discrete random variables*

*Families of discrete random variables*

*Theory of continuous random variables*

*Notable families of continuous random variables*

*Discrete and continuous dual random variables*

Part III: Statistical inference

*Point estimate*

*Interval estimate*

*Hypothesis testing theory*

Part IV: Regression models

*Simple linear regression model*

***READING LIST***

M. Zenga, *Lezioni di statistica descrittiva,* G. Giappichelli, 2007.

M. Zenga, *Elementi di inferenza statistica,* Vita e Pensiero, 2009.

***TEACHING METHOD***

Lectures and assignments.

***ASSESSMENT METHOD***

The exam includes a written test (mandatory) and an oral interview (optional). The written test consists of a theoretical part and a practical part. The theoretical part is worth 16 points and includes an open question (6 points) and ten TRUE/FALSE answer questions (1 point each). The practical part is worth 15 points and involves solving some exercises (the scores of the various exercises are indicated in the exam text). By solving the exercises, the students should demonstrate their ability to apply the techniques of analysis treated in the course to small data sets. The theoretical questions are designed to test their ability to use concepts to solve simple problems of data analysis. The oral test verifies that students have understood the logic behind the various tools for data analysis, are able to illustrate their economic applications and possess basic concepts of mathematical statistics. Only those students who have achieved a positive result in the written test (at least 18/30) are admitted to oral interview; the grade obtained in the oral test may change the grade obtained in the written test of at most 4 points (in both directions).

According to the decisions taken in this regard by the faculty, the written test can be passed by getting a positive result in two written exams: a first mid-term test in the (unique) date approved for this purpose by the faculty, and a second test in exam sessions immediately following the end of the course teaching period. The average marks obtained in intermediate examinations defines the written test grade.

***INSTRUCTIONS AND PREREQUISITES***

More detailed information on the course program, the parts of the recommended texts of specific interest for the course, bibliographical material and additional study, will be provided by the teacher during the lessons and in Blackboard.

As a basic course, teaching does not need any prerequisite for content. It is advisable to follow this course after following the course of *matematica generale* of the first year.

***NOTES***

Information on office hours available on the teacher's personal page at <http://docenti.unicatt.it/>.