## **Statistics I**

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***COURSE AIMS AND INTENDED LEARNING OUTCOMES***

The course covers topics related to the following macro-areas: (a) descriptive statistics (b) probability calculus and sampling.

The main topics will be: Statistics for one-dimensional variables, introduction to bivariate phenomena, random variables and sampling. The course includes a seamless series of lectures with both methodological and applied contents. Excel will be used for some exercises.

At the end of the course, students will be able to prepare a report related to simple databases, and to understand the basics of random phenomena.

***COURSE CONTENT***

Educational objectives that students may achieve during the course

part 1: descriptive statistics

After describing the contents of statistical sciences, the course will introduce the taxonomy of statistical characters, including the main graphical and tabular representations.

Subsequently, the course will present the main indexes used to describe one-dimensional and two-dimensional statistical variables. More specifically, the following topics will be covered:

– Positional indexes

– Dispersion indexes and global variability indexes

– Form indexes.

The course will then introduce students to a statistical analysis of two-dimensional phenomena with comments on the concepts of dependence and independence in case of:

– symmetry (functional dependence given a two way table and stochastic independence concept);

– asymmetry (introduction to linear regression, least squares method and data adjustment measures).

After studying the above mentioned topics, students will be able to perform simple descriptive analyses and write reports.

part 2: probability calculus and sampling

This part of the course will start with an introduction to probability calculus. In particular, the course will focus on the following topics:

– Axiomatic, frequentist and classic definition of probability.

– The urn scheme.

– Definition of random variable.

– Main random variables: uniform (discrete and continuous), Bernoulli’s, binomial, normal (or Gaussian).

– The law of large numbers and the central limit theorem (only formulations).

Then, the course will introduce useful elements to study topics related to statistical inference, including:

– main sampling methods;

– definition of likelihood;

– distribution of sampling random variables.

After completing the analysis of the above mentioned topics, students will be able to deal with the initial concepts related to decision-making procedures under uncertainty.

***READING LIST***

Notes provided by the lecturer.

Optional readings

G. Cicchitelli, *Statistica – Principi e metodi,* Pearson, 2018.

P. Newbold-W.Carlson-B. Thorne, *Statistics for Business and Economics: Global Edition*, Pearson Education Limited, 2012 (or more recent edition).

Some lessons will be taught using Excel.

***TEACHING METHOD***

The course consists of methodological and practical lectures.

***ASSESSMENT METHOD AND CRITERIA***

Written test divided into two parts.

The tests include both applied and theoretical exercises. A mandatory section is provided which, if not passed, makes the test insufficient. Passing this section, without having carried out any exercise of the institutional section, does not make the text sufficient.

***NOTES AND PREREQUISITES***

It is not allowed to split the exam in two separate exam sessions.

To attend the course, students are expected to be familiar with the tools of mathematical analysis taught in the General Mathematics course during the first year. Knowledge of the main properties of limits, series, derivatives, and integrals will be particularly useful.

It is useful to have at least a sufficient knowledge of the use of personal computers and a basic knowledge of the Excel software.