

## 27310 - Statistics II

### Syllabus Information

**Academic year:** 2024/25

**Subject:** 27310 - Statistics II

**Faculty / School:** 109 - Facultad de Economía y Empresa

228 - Facultad de Empresa y Gestión Pública

301 - Facultad de Ciencias Sociales y Humanas

**Degree:** 448 - Degree in Business Administration and Management

454 - Degree in Business Administration and Management

458 - Degree in Business Administration and Management

**ECTS:** 6.0

**Year:** 2

**Semester:** First semester

**Subject type:** Compulsory

**Module:**

### 1. General information

The main objective of this subject is for the student to have the ability to apply and interpret basic statistical tools for the understanding and management of random phenomena linked to the economic field. The subject has a practical profile so that the student learn to analyze, solve and interpret economic realities with the aim of making decisions with scientific rigor. These approaches and objectives are aligned with the Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda (<https://www.un.org/sustainabledevelopment/es/>), specifically, the activities planned in the subject will contribute to the achievement of goals 4 (Ensure inclusive, equitable and quality education and promote lifelong learning opportunities for all) and 8 (Promote sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all).

### 2. Learning results

- Deepen the knowledge of the fundamentals, concepts and statistical methods for the analysis of economic realities.
- Understand and use probability as a measure of uncertainty in economic phenomena.
- Use and plan sampling methods to extract information from an economic phenomenon.
- Know and apply inferential statistical techniques in order to make decisions with scientific rigor.
- Obtain, with the support of ICT, the statistical results needed to estimate or test statements about the data analyzed, measuring the guarantees of the decisions made.
- Infer and corroborate the properties of theoretical models from sample observations and justify their goodness.

### 3. Syllabus

#### PART 1. DISCRETE AND CONTINUOUS RANDOM VARIABLES

Unit 1: Discrete random variable.

Random variables. Probability distribution. Discrete and continuous random variables. Discrete random variable: Probability distribution or mass function. Expected value and its properties. Binomial, Hypergeometric and Poisson distributions.

Unit 2: Continuous random variable.

Continuous random variable: density and probability density functions. Characteristics of a continuous variable. Uniform, Exponential and Normal distributions. Continuous approximations of discrete distributions.

#### PART 2. INTRODUCTION TO SAMPLE THEORY

Unit 3: Introduction to sampling theory.

Basic concepts: population, sample, parameters and statistics. Sampling methods. Simple Random Sampling. Sampling with and without replacement. Sampling distribution of statistics. The importance of the sample-size. Central Limit Theorem.

#### PART 3. INFERENCE METHODS: ESTIMATION AND HYPOTHESIS TESTS

Unit 4: Point and interval estimation.

Concept of estimator. Point estimators. Confidence interval estimation. Construction of a confidence interval: the pivot method. Confidence intervals to estimate the population mean, the population variance and the population proportion. Sample size determination.

Unit 5: Hypotheses testing.

Basic concepts: Simple, composite, null and alternative hypotheses, significance level, p-value and power of a test and types of errors. Parametric hypothesis testing. Hypothesis Tests about the mean and the variance of a normal distribution, tests about the Bernoulli parameter. Non parametric hypothesis tests.

### 4. Academic activities

Lectures: 30 hours

Computer labs: 30 hours

Individual homework: 85 hours

Test and global exam: 5 hours

6 ECTS = 150 hours

The lectures will be mainly invested in the introduction of the basic concepts and the theoretical developments of each lesson.

Expository lectures will be used, always encouraging the participation and discussion in the classroom. Computer lab aim to show the student how to address and solve problems. The sessions will take place either in the classroom or in the computer room.

This methodology is planned for in person teaching. Nevertheless, if health issues arise during the semester, that impose restrictions, the sessions may be taught in a blended manner or even completely online.

## 5. Assessment system

There are two calls, in which the subject will be evaluated through a overall evaluation.

In the first call, two types of tests will be carried out: the first will be through continuous monitoring tests (S) that will be carried out in class during the semester and the other will be a written test (E) that will be carried out on the date of the official call for the subject.

The continuous monitoring tests (S) consist of the resolution of theoretical or practical questions that will be proposed in class at the end of each topic or thematic block. The estimated number of continuous monitoring tests ranges between 6 and 10. To pass this exam, the student must take at least 80% of the tests and the grade will be calculated taking 80% of the better grades achieved. The score for this test must reach at least three points out of 10 to be averaged with the written test.

The written test (E) consists of solving practical problems and can be subdivided into two parts: one will be carried out in normal classrooms and the other will be carried out in computer rooms using the software taught in class. This written test (E) must have a grade of at least three points out of 10 to average with the continuous monitoring test.

In the first call, there are two possibilities to calculate the final grade for the subject. If the student participates and passes the continuous monitoring tests, the final grade will be  $Final\_grade=0.25\cdot S+0.75\cdot E$ . If the student does not participate or does not pass the continuous monitoring questions, the final grade will be  $Final\_Grade=E$ . To pass the subject, the student must obtain at least 3 points out of 10 in each of the tests (S) and (E) and a final grade equal to or greater than 5. Otherwise, the student must take the second call.

In the second call, the final grade will be calculated as the maximum of the two possibilities of the first call, that is,  $Final\_grade=\max\{0.25\cdot S+0.75\cdot E, E\}$  if the student has participated and passed continuous monitoring tests. Otherwise,  $Final\_grade=E$ . In any case, the student must obtain at least 3 points out of 10 in each of the tests (S) and (E) and a final grade equal to or greater than 5 to pass the subject.

Assessment criteria:

In the two tests (S) and (E) the statement, development, results and interpretation of the solutions to the proposed problems or the real situation analyzed will be assessed.

It is planned that these tests will be carried out in person, but if circumstances require it, they will be carried out semi-in-person or online. In the case of online evaluation, it is important to highlight that, in any test, the student may be recorded, and the student may exercise his or her rights by the procedure indicated in:

[https://protecciondatos.unizar.es/sites/protecciondatos.unizar.es/files/users/lopd/gdocencia\\_reducida.pdf](https://protecciondatos.unizar.es/sites/protecciondatos.unizar.es/files/users/lopd/gdocencia_reducida.pdf).

Appropriate tools to verify the originality of the activities carried out will be used. When plagiarism or copying is detected in an activity, the evaluation regulations approved by the center and the University of Zaragoza will be applied.

## 6. Sustainable Development Goals

4 - Quality Education

8 - Decent Work and Economic Growth