

Academic Year: (2024 / 2025)

Review date: 11-03-2024

Department assigned to the subject: Statistics Department

Coordinating teacher: DURBAN REGUERA, MARIA LUZ

Type: Compulsory ECTS Credits : 6.0

Year : 2 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Statistics for Social Sciences I or a similar introductory statistics course.

OBJECTIVES

Specific competences:

1. Understanding the basic concepts of statistical inference and its applications in the social sciences.
2. Capacity for applying simple linear regression and interpreting the results.
3. Capacity for applying multiple linear regression and interpreting the results.
4. Effective use of statistical software.

Transversal competences:

1. Capacity for analysis and synthesis.
2. Capacity for mathematical and statistical modeling.
3. Problem solving.
4. Critical reasoning.
5. Oral and written communication.

DESCRIPTION OF CONTENTS: PROGRAMME

Topic 1. Advanced hypothesis testing

- 1.0. - Hypothesis testing and the p-value's role on the null hypothesis's conditional probability.
- 1.1. - Comparing two populations
- 1.2. - ANOVA
- 1.3. - Exercises

Topic 2. Simple Linear Regression

- 2.1.- Motivation, examples and applications. Model formulation and parameter interpretation.
- 2.2.- Nonlinear relationships and linearizing transformations.
- 2.3.- Point and interval estimation of the model parameters.
- 2.4.- Hypothesis testing; statistical significance of estimated parameters.
- 2.5.- Model checking and residual analysis.

Topic 3. Multiple Linear Regression

- 3.1.- Motivation, examples and applications. Model formulation and parameter interpretation within the model.
- 3.2.- Inference on model parameters: confidence intervals; inference on the response.
- 3.3.- Marginal effects. Adjusted R-squared.
- 3.4.- Multicollinearity. Residual analysis.
- 3.5.- Variable selection methods.
- 3.6.- Considering categorical variables.

Topic 4 Final Project

LEARNING ACTIVITIES AND METHODOLOGY

Theory (3 ECTS). Theory classes with supporting material available in the course's web page.

Practical classes (3 ECTS). Problem-solving classes. Practical classes with personal computer.

Weekly individual tutoring sessions.

The teaching methodology will be eminently practical, being based on the study of diverse data sets through inference and regression techniques, both in the theory and practical classes, as motivation and illustration of the theory.

ASSESSMENT SYSTEM

% end-of-term-examination: 40

% of continuous assessment (assignments, laboratory, practicals...): 60

Continuous assessment: 60%. It will be based on two partial multiple-choice tests (30% each).

Final exam: 40%. A mark of at least 4 points out of 10 in the final exam will be required to pass the course.

The extraordinary exam will count for 100% of the final grade.

The use of Artificial Intelligence tools is selectively allowed in this subject.

The faculty may indicate a list of works and exercises that the student can perform using AI tools, specifying how they should be used, and how the student should describe the use made of them. If the use of AI by the student gives rise to academic fraud by falsifying the results of an exam or work required to accredit academic performance, the provisions of the Regulation of the University Carlos III of Madrid of partial development of the Law 3/2022, of February 24th, of University Coexistence will be applied.

BASIC BIBLIOGRAPHY

- Chatterjee, S. Regression analysis by example, Wiley, 2000
- J.F. Hair, W.C. Black, B.J. Babin, R.E. Anderson Multivariate Data Analysis: A Global Perspective, 7th ed. , Pearson Education, 2010
- Remenyi, D. et al.. An introduction to statistics using Microsoft Excel., Academic Publishing. , 2010
- YOUNGER, M. S. A First Course in Linear Regression, Duxbury Press, 1985

ADDITIONAL BIBLIOGRAPHY

- D.J. Bartholomew, F. Steele, I. Moustaki, J. Galbraith Analysis of Multivariate Social Science Data, 2nd ed., Chapman & Hall/CRC, 2008