

29815 - Statistics

Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura 326 - Escuela Universitaria Politécnica de Teruel
Degree	440 - Bachelor's Degree in Electronic and Automatic Engineering 444 - Bachelor's Degree in Electronic and Automatic Engineering
ECTS	6.0
Course	2
Period	Half-yearly
Subject Type	Basic Education
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

The learning process designed for this subject is based on the following:

The proposed methodology seeks to promote student work and continued focus on the practical aspects of statistics: working with real data.

29815 - Statistics

In sessions with the whole group, theoretical aspects are addressed in the form of master class. These theoretical sessions will be complemented with practical classes in small groups, in which real problems and cases are solved.

The real data processing is done in sessions in the computer lab where the students learn to handle statistical software and also are solved basic optimization problems.

The assessment focuses on both theoretical and applied aspects according to the evaluation criteria established.

5.2.Learning activities

The program that the student is offered to help you achieve the expected results includes the following activities...

1: SITE WORK: 2.4 ECTS (60 hours)

The course is organized with 4 hours of class a week for the 15 weeks of the semester. Of these, two hours are given to the entire group for exposure of theoretical concepts and examples. Other two hours are given to small groups, usually in the computer lab, to develop skills in posing real problems (modeling or selection of proper technique), resolution and interpretation of results.

More specifically:

Activity Type I : Lectures (30 hours with the entire group of students). In these sessions theoretical aspects are addressed in the form of participatory lecture to facilitate their assimilation. Following these classes is fundamental for the consolidation and development of programmed learning good.

Activity Type III : Problem solving and case studies classes (30 hours in small groups). The lectures are supplemented by problem solving sessions and case studies. As far as possible computer lab will be used in these sessions. Sessions computer lab are designed for students to manage a statistical software support troubleshooting and data analysis exercises involving on the one hand, the selection of the proper technique applied to the data and on the other hand the interpretation of the results. During these classes they are scheduled activities to incorporate methodological strategies that promote participatory learning and formative assessment.

For educational reasons, the same software practices (or other learning activities) will be used in all groups of teaching of the subject of a specific Center (EINA of Zaragoza and EUP Teruel)

2: NON-CONTACT WORK: 3.6 ECTS (90 hours)

Activity Type VI : Practical work (15 hours of non-contact work). An activity scheduled throughout the course is the

realization of a small project that results in a statistical report.

Activity type VII : Personal study (70 hours of non-contact work).

Activity type VIII : Evaluation (5 hours of non-contact work).

5.3.Program

MODULE: Exploratory data analysis

1. Exploratory analysis of one variable: frequency table, descriptive measures of central tendency, dispersion and form, graphical representations.
2. Exploratory analysis of two or more variables: relationships between variables, correlation coefficient, linear regression. Cross tabulations and chi square test of independence.
3. Goodness-of- fit test.
4. Introduction to statistical quality control. Variables control charts.

MODULE: Probability distribution models

1. Introduction to probability theory. Random experiment. Laplacian and frequentist interpretations of probability. Axiomatic definition of probability. Conditional probability. Independence of events. Complete system of events. Total probability theorem. Bayes theorem.
2. Concept of random variable. Classification. Discrete random variable: probability function, distribution function, properties. Continuous random variables: density function, distribution function, properties.
3. Characteristics of random variables. Expected value of a random variable. Moments of a random variable: variance, skewness, kurtosis. Quantile of a random variable. Chebyshev inequality. Two dimensional distributions: joint, marginal and conditional distributions. Calculation of expected values and variances of linear combinations of random variables.
4. Main discrete and continuous distributions: Bernoulli, binomial, Poisson, geometric, negative binomial, hypergeometric, uniform, exponential, gamma, chi square, normal. Reproductivity of random variables. Poisson process and relation with the exponential and gamma distributions. Approximations between variables. Two dimensional normal distribution.

MODULE: sampling, estimation and hypothesis testing

1. Sampling and estimation. Statistical and sampling distributions. Bernoulli's theorem, central limit theorem and Fisher's theorem. Calculation of the minimum sample size. Distributions associated with sampling on normal populations: chi square, t and F. Construction of a confidence interval. Confidence intervals for means, variances and proportions.

29815 - Statistics

2. Hypothesis testing. Null and alternative hypotheses. Type I and II errors. Significance level, confidence level and power of the test. Relationship of confidence intervals and bilateral hypothesis tests. Hypothesis testing for means, variances and proportions. Calculating the p-value of the test.

MODULE: Introduction to Optimization

1. Optimization problems. Decision variables, objective function and constraints. Classification of optimization problems. Linear Programming: graphic resolution. Integer programming: knapsack and traveling salesman problem.

5.4.Planning and scheduling

Following the academic calendar established by the Centre, shall be indicated in class.

5.5.Bibliography and recommended resources

- Devore, Jay L.. Probabilidad y estadística para ingeniería y ciencias / Jay L. Devore . 7^a ed. Mexico [etc] : Cengage Learning, cop. 2008
- Hillier, Frederick S.. Investigación de Operaciones / Frederick S. Hillier, Gerald J. Lieberman ; Casos desarrollados por Karl Schmedders y Molly Stephens ; Tutorial de software desarrollado por Mark Hillier y Michael O'Sullivan . - 7a ed. México [etc.] : McGraw-Hill, 2001
- Montgomery, Douglas C.. Probabilidad y estadística aplicadas a la ingeniería / Douglas C. Montgomery, George C. Runger . 2^a ed., [reimpr.] México, D. F. : Limusa Wiley, cop. 2007
- Ross, Sheldon M.. Introducción a la estadística / Sheldon M. Ross . Barcelona : Reverté, D. L. 2007