30207 - Statistics

Información del Plan Docente

Academic Year	2018/19
Subject	30207 - Statistics
Faculty / School	110 - Escuela de Ingeniería y Arquitectura 326 - Escuela Universitaria Politécnica de Teruel
Degree	443 - Bachelor's Degree in Informatics Engineering 439 - Bachelor's Degree in Informatics Engineering
ECTS	6.0
Year	1
Semester	Second semester
Subject Type	Basic Education
Module	

1.General information

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The proposed methodology aims at encouraging students for every day work. The student's interest is promoted by means of a practical approach based on the use of actual problems and data.

The general principles of this course are presented in large-group-sessions where a fomal description is carried out with applications in standard examples this classes are complemented with real problem classes in small groups. Classes in computer room deal with both data analysis and modelling of real events. Students completing them will be able to use

specific statistical software.

4.2.Learning tasks

This course comprises three learning blocks:

Block 1: *Explanatory Data Analysus*

Block 2: *Probability models*

Block 3: *Statistical inference*

4.3.Syllabus

BLOCK 1: EXPLORATORY DATA ANALYSIS

1. Descriptive statistics for one variable: descriptive measures (location, dispersión, skewness and kurtosis) and univariate graphs.

2. Model checking: Percentiles and probability plots.

3. Descriptive statistics for several variables: association measures, correlation coefficient, smoothing and fitting simple regression lines to data.

BLOCK 2: PROBABILITY MODELS

1. Introduction to probability: Random experiments. Sample space and events. The axioms of probability. Consequences. Conditional probability. Partition of the sample space. Total probability rule and Bayes formula. Independence of two events. Mutually independent events.

2. Random variables and characteristics: Definition of random variable: discrete and continuous. Distribution function. Probability mass function. Discrete random variable. Continuous random variable: density function. Conditional distribution. Expected value of a random variable. Expected value of a function of a random variable. Properties of the expected value. Variance and its properties. Standard deviation. Skewness and kurtosis. Percentile. Probability bounds: Chebyshev's inequality.

3. Main probability models: Sampling with and without replacement. Hypergeometric distribution. Bernoulli process: Bernoulli, binomial, geometric and negative binomial distributions. Poisson process: Poisson, exponential and gamma distribution. Uniform and normal distributions.

4. Multivariate random variables. Joint, marginal and conditional distributions. Conditional expected value. Independent variables. Reproductive property of a sum of variables.

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BLOCK 3: STATISTICAL INFERENCE

1. Random sampling: Likelihood function. Statistics. Sampling distribution. Chi-squared, t-Student and F-Snedecor distributions. Central limit theorem. Fisher theorem. Computation of the random sample size.

2. Point estimation and confidence intervals: Unbiased estimators. Variance of a Point Estimator. Standard Error. Methods of point estimation, method of moments and maximum likekihood. Opyimization in Inference. Confidencei ntervals on the mean, the variance and a population proportion.

3. Tests of hypothesis: Hypothesis testing. Null and alternative hypothesis. One-sided and two-sided hypotheses. Type I and type II errors. Power and sample size. Connection between hypothesis tests and confidence intervals. Tests on the mean, variance and a population proportion. Statistical inference for two samples. Tests on difference in means, on the variances ratio and on two population proportions. Paired t-test. Independence tests. Chi-Squared test.

4.4.Course planning and calendar

The course corresponds to 6 ECTS equivalent to 150 hours of activities for students with the following distribution:

Classroom activities

- 30 hours (2hours/week) master class in large-group-class.
- 15 hours (1 hour/week) of problems in small group (2 groups)
- 14 h (7 classes of 2 hours 2hour/2week) in computer roon in small group (4 grups)

Out of classroom activities

- Self-study 70 h
- Statistical report 15 h

Evaluation activities

- 6 hours

4.5.Bibliography and recommended resources