



Universitat de Lleida

DEGREE CURRICULUM

STATISTICAL METHODS

Academic year 2014-15

Subject's general information

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| Subject name | Statistical Methods |
| Code | 102103 |
| Semester | 2nd. |
| Typology | Compulsory |
| ECTS credits | 6 |
| Groups | 3 |
| Theoretical credits | 3 |
| Practical credits | 3 |
| Office and hour of attention | Agree an appointment by e-mail. |
| Department | Mathematics |
| Teaching load distribution between lectures and independent student work | 40% 60% |
| Modality | Presencial |
| Important information on data processing | Consult this link for more information. |
| Language | Catalan |
| Degree | Degree in Automation and Industrial Electronic Engineering. Degree in Mechanical Engineering |
| Distribution of credits | Nacho Lopez Lorenzo 2.4 Francisco Sebé Feixas 4.8 Josep Conde Colom 9.6 |
| Office and hour of attention | Agree an appointment by e-mail. |
| E-mail addresses | nlopez@matematica.udl.cat fsebe@matematica.udl.cat jconde@matematica.udl.cat |

Nacho Lopez Lorenzo
Francisco Sebé Feixas
Josep Conde Colom

Subject's extra information

We recommend a continuous work during the whole semester so as to get the objectives of the subject. We also recommend to visit regularly the virtual campus since the relevant information is announced there. The personal e-mail of the lecturers is the preferred way of contacting them (avoid using the virtual campus messaging tool).

Learning objectives

- Count the elements of a set by means of combinatorics techniques.
- Compute probabilities by applying events algebra.
- Define a random variable and make computations through its density and distribution functions.
- Determine the distribution model of the random variable related to a random event and make computations.
- Compute representative values and graphically represent a data set.

Competences

Degree-specific competences

- Ability to resolve logical problems that can arise in engineering. Aptitude to apply knowledge about lineal algebra; geometry; differential geometry; differential and integral calculus; differential equations and partial derivatives; numeric methods, numeric algorithms; statistics and optimization.

Degree-transversal competences

- Ability for abstraction and critical, logical and logical reasoning.
- Ability to resolve problems and elaborate and defend arguments inside their field of study
- Ability to analyse and synthesize.

Subject contents

Chapter 1. Combinatorics and probability computation.

- Introduction to combinatorics: variations, permutations and combinations. Newton binomial.
- Experiences and random events. Incompatible and independent events.
- Probability computation. Properties.
- Conditional probability.
- Total and Bayes probabilities.

Chapter 2. Random variables. General aspects.

- From the histogram to the density function of a continuous random variable.
- Discrete variables. Probability function.
- Expectation and variance of a random variable. Properties.
- The density function and distribution function.

Chapter 3. Probability distribution models.

- Discrete models: Binomial and Poisson.
- The normal model. Central limit theorem.
- Tabulation of a probability distribution function.

Chapter 4. Exploratory data analysis. Basic tools for quality enhancement.

- Basic concepts on statistical studies: population, variable, sample.
- Qualitative and quantitative variables.
- Data collecting and tabulation.
- Methods for data representation: bars and pareto diagrams, histograms.
- Bivariate diagrams.
- Results interpretation.
- Parameters related to a random variable distribution: mean and standard deviation. Properties.

Methodology

- The activities will be divided into two complementary parts: theory and problems. In the lectures, the concepts and relevant theoretical results illustrated with examples and exercises are introduced. In the practical part, exercises with increasing difficulty will be solved to consolidate the concepts and notions developed in the lectures. Problems with real data are included to show the power of statistical tools in engineering.
- Students have the responsibility to strengthen their knowledge autonomously by using the teaching material provided or recommended by the teacher.
- Both the theoretical and the practical classes will be taught in small groups of students. Smaller groups of students favors dialogue and participation.

Development plan

Development plan:

Timing of the contents of the subject:

- Weeks 1, 2 and 3 (Chapter 1. Combinatorics and probability computation.)
- Weeks 4, 5 and 6 (Chapter 2. Random variables. General aspects.)
- Weeks 7, 8, 9 and 10 (Chapter 3. Probability distribution models.)
- Weeks 11, 12 and 13 (Chapter 4. Exploratory data analysis. Basic tools for quality enhancement.)
- Weeks 14 and 15 (Laboratory practices with statistical software.)

Evaluation

Timing and load percentage assessment activities:

- Week 6. Delivery of an exercise proposed by the teacher and solved at classroom by the student. This activity contributes 10% of the total mark for the course, maximum 1 point.
- Week 9. Practical examination of the content developed in the first weeks until the ninth. This activity contributes 40% of the total mark for the course, maximum 4 points.
- Week 13. Delivery of a practical test developed with a statistical software and resolved in the computer lab. This activity contributes 10% of the total mark for the course, maximum 1 point.
- Week 16. Practical examination of the content developed in the weeks of 10 to 15. This activity contributes 40% of the total mark for the course, maximum 4 points .

The final will be configured with the arithmetic sum of the marks obtained in the aforementioned activities. The

course will be overcome if the mark is a value equal to or greater than five. There will be recoveries of written tests of 4 points.

Bibliography

J. ESTEBAN GARCÍA i alt. (2011) "Inferencia Estadística". Ibergarceta Ediciones.

S. FORCADA i J. RUBIÓ (2007) "Elements d'Estadística". Edicions de la UPC. Barcelona

P. GRIMA i alt. (1996) "Estadística. Problemas". Edicions de la UPC. Barcelona

D. PEÑA (1994) "Estadística. Modelos y Métodos" Vol. 1 i 2. Alianza Editorial

A. PRAT i alt. (1997) "Métodos Estadísticos. Control y Mejora de la Calidad". Edicions de la UPC. Barcelona

L. RUIZ-MAYA y F.J. MARTIN PLIEGO "Estadística" Vol 1 i 2. AC

R.E. WALPOLE, R.H. MYERS, S.L. MYERS & K. YE (2007 8ed.) Probabilidad y Estadística para ingeniería y ciencias. Pearson, Prentice Hall.