DEGREE CURRICULUM

STATISTICAL METHODS

Coordination: CONDE COLOM, JOSEP

Academic year 2016-17

STATISTICAL METHODS 2016-17

Subject's general information

Subject name	STATISTICAL METHODS
Code	102103
Semester	2nd Q(SEMESTER) CONTINUED EVALUATION
Typology	<table><tr><th>Degree</th><th>Course</th><th>Typology</th><th>Modality</th></tr><tr><td>Bachelor's Degree in Automation and Industrial Electronic Engineering</td><td>2</td><td>COMMON</td><td>Attendance-based</td></tr><tr><td>Bachelor's Degree in Mechanical Engineering</td><td>2</td><td>COMMON</td><td>Attendance-based</td></tr></table>
ECTS credits	6
Groups	2GG,2GM
Theoretical credits	3
Practical credits	3
Coordination	CONDE COLOM, JOSEP
Department	MATEMATICA
Teaching load distribution between lectures and independent student work	40% 60%
Important information on data processing	Consult this link for more information.
Language	Catalan
Distribution of credits	Nacho Lopez Lorenzo 6 Josep Conde Colom 6
Office and hour of attention	Agree an appointment by e-mail.

STATISTICAL METHODS 2016-17

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
CONDE COLOM, JOSEP	jconde@matematica.udl.cat	6	Personalized: to contact the teacher via email
LOPEZ LORENZO, IGNACIO	nlopez@matematica.udl.cat	6	Personalized: to contact the teacher via email

Subject's extra information

We recommend a continuous work during the whole semester so as to get the objetives 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.
- Understand the results obtained in applying the statistical methods explained.

Competences

Degree-specific competences

- **GEEIA1**. 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

- **EPS1**. Ability to resolve problems and elaborate and defend arguments inside their field of study
- **EPS5**. Ability for abstraction and critical, logical and logical reasoning.
- **EPS6**. Ability to analyse and synthesize.

University strategic competences

- **CT5**. Acquire knowledge in scientific thinking.

Subject contents

1. Combinatorics and probability computation.

1.1 Introduction to combinatorics: variations, permutations and combinations. Newton binomial.

1.2 Experiences and random events. Incompatible and independent events.

1.3 Probability computation. Properties.

1.4 Conditional probability.

1.5 Total and Bayes probabilities.

2. Random variables. General aspects.

2.1 From the histogram to the density function of a continuous random variable.

2.2 Discrete variables. Probability function.

2.3 Expectation and variance of a random variable. Properties.

2.4 The density function and distribution function.

3. Probability distribution models.

3.1 Discrete models: Binomial and Poisson.

3.2 The normal model. Central limit theorem.

3.3 Tabulation of a probability distribution function.

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

4.1 Basic concepts on statistical studies: population, variable, sample.

4.2 Qualitative and quantitative variables.

4.3 Data collecting and tabulation.

4.4 Methods for data representation: bars and pareto diagrams, histograms.

4.5 Bivariate diagrams.

4.6 Results interpretation.

4.7 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.

- **Lectures:** In the lectures, the concepts and relevant theoretical results illustrated with examples and exercises are introduced.
- **Problems**: 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.
- **Evaluation:** The evaluation tests or evidence will be assessed the theoretical concepts and problem solving as described in classroom activities. There will be two written tests each with a maximum of 40% of the mark, a follow-up to a maximum of 10% of the grade and practice with statistical software also worth a 10% of the mark.

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

STATISTICAL METHODS 2016-17

Timing of the contents of the subject:

WEEK	METHODOLOGY	CONTENTS	PRESENTIAL	AUTONOMOUS WORK
1, 2 i 3	Lecture and Problem class	Combinatorics and probability computation	12	18
4, 5 i 6	Lecture and Problem class	Random variables. General aspects	12	18
7, 8, 9 i 10	Lecture and Problem class	Probability distribution models	24	36
11, 12 i 13	Lecture and Problems	Exploratory data analysis. Basic tools for quality enhancement	12	18
14 i 15	Laboratory practices	Statistical software	8	12

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 recoveries of written tests of 4 points.

Bibliography

J. ESTEBAN GARCÍA i alt. (2011) “Inferencia Estadística”. IbergarcetaEdiciones.

S. FORCADA i J. RUBIÓ (2007) “Elements d’Estadística”. Edicions de laUPC. Barcelona

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

D. PEÑA (1994) “Estadística. Modelos y Métodos” Vol. 1 i 2. AlianzaEditorial

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. MYRES & K. YE (2007 8ed.) Probabilidad y Estadística para ingeniería y ciencias. Pearson, Prentice Hall.