Statistics

Academic Year: (2020 / 2021) **Review date: 09-07-2020**

Department assigned to the subject: Statistics Department

Coordinating teacher: CASCOS FERNANDEZ, IGNACIO

Type: Compulsory ECTS Credits : 6.0

Year : 3 Semester : 1

Branch of knowledge: Engineering and Architecture

OBJECTIVES

Once successfully having studied this subject, the students should be able to:
- Analize problems involving random phenomena
- Define populations for a statistical study
- Build Hypothesis about a distribution
- Estimate and test hypothesis about the paramters of the chosen model
- Evaluate how well does the model fit to reality
- Understand the limitations of the methods that have been studied and the conditions under which they lead to wrong conclusions

DESCRIPTION OF CONTENTS: PROGRAMME

BLOCK I: PROBABILITY
1. Introduction to Probability
1.1 Introduction
1.2 Random phenomena
1.3 Definition of probability and properties
1.4 Conditional probability
1.5 Bayes Theorem
2. Random variables
2.1 Definition of random variable
2.2 Discrete random variables
2.3 Continuous random variables
2.4 Characteristic features of a random variable
2.5 Transformations of random variables
2.6 Random vectors
3. Distribution models
3.1 Binomial distribution
3.2 Poisson distribution
3.3 Geometric distribution
3.4 Uniform distribution (continuous)
3.5 Exponential distribution
3.6 Normal distribution (with CLT)
BLOCK II: ESTIMATION AND INFERENCE
4. Parameter estimation
4.1 Introduction and basic concepts
4.2 Sampling distributions
4.3 Maximum Likelihood Estimation
4.4 Properties of Maximum Likelihood Estimators
4.5 Inference based on MLEs
5. Statistical Inference
5.1 Introduction
5.2 Confidence Intervals
5.3 Hypothesis testing
5.4 Particualr tests on a single sample
5.5 Comparison of two populations
BLOCK III: REGRESSION
6. Linear regression
6.1 Introduction
6.2 Simple linear regression

6.3 Multiple linear regression
6.4 Comparison of three or more population means (ANOVA)

LEARNING ACTIVITIES AND METHODOLOGY

- Lectures: introducing the theoretical concepts and developments with examples, 2.2 ECTS
- Problem solving sessions: 2.2 ECTS
- Computer (practical) sessions: 0.6 ECTS --- 4 SESSIONS
- Evaluation sessions (continuous evaluation and final exam): 1 ECTS

ASSESSMENT SYSTEM

There will be continuous evaluation by means of two partial examinations. Each partial examination will be composed of problems and multiple-choice questions. There will be some questions about the computer sessions at those exams.

If the grade obtained at the continuous evaluation is 6 or higher, the student should not attend the final exam and his/her final grade will be the grade of the continuous evaluation.

If the grade obtained at the continuous evaluation is lower than 6, the student will have to attend the final exam. For those students, the final grade will be computed giving a 40% weight to the partial examinations, and a 60% weight to the grade at the final exam.

The grade for the students attending the extraordinary examination will be the grade obtained at such exam.

% end-of-term-examination:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

BASIC BIBLIOGRAPHY

- Douglas C. Montgomery and George C. Runger Applied Statistics and Probability for Engineers (3rd ed), Johan Wiley & Sons, 2003
- Navidi, W. Statistics for Engineers and Scientists, McGraw-Hill, 2006

ADDITIONAL BIBLIOGRAPHY

- Daniel Peña Regresión y Diseño de Experimentos, Alianza Editorial, 2002
- John D. Enderle, David D. Farden, Daniel J. Krause Basic Probability Theory for Biomedical Engineers, Morgan & Claypool, 2006
- John D. Enderle, David D. Farden, Daniel J. Krause Advanced Probability Theory for Biomedical Engineers, Morgan & Claypool, 2006
- Kristina M. Ropella Introduction to Statistics for Biomedical Engineers, Morgan & Claypool Publishers, 2007