Statistics

Academic Year: (2022 / 2023) **Review date: 11-05-2022**

Department assigned to the subject: Statistics Department

Coordinating teacher: DURBAN REGUERA, MARIA LUZ

Type: Basic Core ECTS Credits : 6.0

Year : 1 Semester : 2

Branch of knowledge: Social Sciences and Law

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Calculus I
Linear Algebra

OBJECTIVES

The aim of this course is to make the student familiar with the basic concepts of probability, random variables and stochastic processes. In order to achieve this goal, the student should acquire knowledge and skills.

With respect to the knowledge, at the end of the course, the student should be able to:

-Know and use the basic concepts and properties of probability.
-Understand the concept of density and probability function of random variables and vectors.
-Identify and understand transformations of random variables and vectors.
-Understand the concept of signals and knoise as stochastic processes.

The student will gain specific and general skills:

Specific skills:

-Calculate the reliability of a system
-Manage the concept of random variables in the context of telecommunications
-Work with transformations of random variables and their properties
-Identify and classify stochastic process, and calculate their statistics.

General skills:

-Capacity to identify and apply theoretical concepts to real problems. This skill will be acquired by solving problems proposed in class
-Hability to analyze data and interpret results. This skill will be developed in class and in computel labs
-Effective communication of knowledge and statistical results. This skill will be acquired by solving problems in class and in computer labs
-Capacity to work in groups, in an effective, responsible and creative manner. This skill will be acquired by solving computer labs exercises in groups and solving problems in class

DESCRIPTION OF CONTENTS: PROGRAMME

In this course, the students study the foundations of probability and random variables. The programm is divided in 5 blocks:
* Probability
-Events
-Properties of probability
-Laplace rule
-Conditional probability and independence of events
-Bayes Theorem

*Random Variables
-Definition of random variable
-Dicrete random variables: probability and distribution functions

-Continuous random variables: density and distribution functions
-Moments of a random variable
-Transformation of random variables

*Probability models
-Bernouilli and Binomial
-Poisson
-Exponencial
-Normal
-Central Limit Theorem: Approximation of random variables

*Random Vectors
-Joint distribution
-Discrete and continupus random vectors: Joint probability, density and distribution functions
-Marginal distributions
-Conditional distributions, independence of events
-Moments of a random vector
-Transformations of renaom vectors

*Stochastic Processes
-Definition and classification of processes
-Distribution function
-Characteristic measures: Mean, Variance, Autocovariance, Autocorrelation
-Correlation between processes, independence, orthogonality
-Stationarity
-Ergodicity

LEARNING ACTIVITIES AND METHODOLOGY

-Theory classes: Presentation of basic concepts and examples. In order to help the student to acquire the relevant knowledge, a basic textbook will be available, as well as slides and problem sheets 2.5 ECTS
-Problem solving classes: Solving exercises in small groups 2.2 ECTS
-Computer Laboratories: Work in groups and presentation of reports 0.3 ECTS
-Evaluation: 1 ECTS

ASSESSMENT SYSTEM

There will be continuous evaluation by means of tests and exams (PO a, b, e), and by the presentation of reports correponding to exrecises proposed in the computer classes (PO b, d, e, g).

If the mark obtained in the continuous evaluation are equal or higher than 5, the final mark will be computed giving a 90% weight to this mark and 10% to the mark obtained in the computer-lab exercises.

If the mark obtained in the continuous evaluation are lower than 5, the student will have to set a final exam. The final mark will be computed giving a 30% weight to the continuous evaluation mark, a 60% to the mark in the final exam and 10% to the mark obtained in the computer-lab exercises.

The evaluation of the extraordinary examination will be as follows the maximum between:

1) 30% of continuous evaluation+ 60% final exam +10% computer labs
2) 100% final exam

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

BASIC BIBLIOGRAPHY

- Juan Ruiz, J., Palomo Sánchez, J.G., Sánchez Naranjo, M.J. y Sánchez R. Morcillo, I. Problemas Resueltos de Estadística, Sintesis.
- Peebles, P.Z. Principios de probabilidad, variables aleatorias and señales aleatorias, McGraw-Hill..
- Peña, D. Fundamentos de Estadística, Alianza.

ADDITIONAL BIBLIOGRAPHY

- Haykin, S. Communication Systems,, Wiley.
- Papoulis,A. Probability, Random Variables and Stochastic Processes, McGraw-Hill.
- Proakis, G.J. y Salehi, M. Communication Systems Engineering, Prentice Hall.