

Academic Year: ( 2021 / 2022 )

Review date: 22-06-2021

Department assigned to the subject: Statistics Department

Coordinating teacher: JIMENEZ RECAREDO, RAUL JOSE

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)**

Probability I

**OBJECTIVES****SPECIFIC COMPETENCES**

1. Understand the concept of random vector: description and applications.
2. Use the concept of correlation.
3. Work with the multivariate normal distribution.
4. Use the limit theorems and asymptotic results in statistical applications.
5. Understand the concept of statistics and its sampling distribution.
6. Obtain the sampling distribution of estimators in normal population and derive the associated confidence intervals.
7. Use computational tools for calculation of confidence intervals.

**CROSS COMPETENCES**

1. Information Management Skills.
2. Solve Problems independently.
3. To be capable of using creative thoughts when it comes to solve problems.
4. Critical Reasoning.

**DESCRIPTION OF CONTENTS: PROGRAMME**

0. Introduction to multivariate data analysis.
  - 0.1 Representations and graphics of qualitative and discrete data.
  - 0.2. Representations and numerical summaries of quantitative data: covariance and correlation.
1. Discrete random vectors.
  - 1.1. Joint, marginal and conditional distributions.
  - 1.2. Independence.
  - 1.3. Functions of random vectors.
  - 1.4. Expected value and variance, conditional expectation.
  - 1.5. Discrete multivariate models.
2. Continuous Random vectors.
  - 2.1. Joint, marginal and conditional distributions.
  - 2.2. Independence. Functions of random vectors.
  - 2.3. Change of variable. Expected value and variance.
  - 2.4 Conditional expectation.
  - 2.5. Multidimensional normal distribution.
  - 2.6 Distribution related to the Normal distribution (chi-square and t-student)
3. Generating functions and convergence of random variables.
  - 3.1. Markov inequality and convergence in probability.
  - 3.2. Laws of large numbers and Monte Carlo Method.
  - 3.3. Generating functions and moments.
  - 3.4. Convergence in distribution and Central Limit Theorem

#### LEARNING ACTIVITIES AND METHODOLOGY

Theory (4 ECTS). Lectures with available material posted in internet. Problems (2 ECTS) Problem Solving classes. Work assignments in groups.

#### ASSESSMENT SYSTEM

Final examination 40%. tests, homework exercises 60%.  
Students who obtain a good continuous grading may exempt the final exam.

<b>% end-of-term-examination:</b>	40
<b>% of continuous assessment (assignments, laboratory, practicals...):</b>	60

#### BASIC BIBLIOGRAPHY

- Casella, G. y Berger, R.L. Statistical Inference, Wadsworth and Brooks. 1990.

#### ADDITIONAL BIBLIOGRAPHY

- Durrett, R. The Essentials of Probability, Duxbury Press. 1994.
- Grimmett, G. y D. J. A. Welsh. Probability: An introduction., Oxford University Press, 2003