## Universidad Carlos III de Madrid

### Elementary statistical theory II

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)
    Teoría Estadística Elemental 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

    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.
    2.4. Expected value and variance, conditional expectation.
    2.4. Bimensional normal distribution.

    3. Introduction to statistical inference.
    3.1.Simple random samples.
    3.2. Markov inequality and weak law of large numbers.
    3.3. Central Limit Theorem.
    3.4. Sampling distributions based on normal populations (chi-square and Student t test).
    3.5. Confidence intervals.

## 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 exam 50%. tests, labs  homework exercises 50%.

| | |
|---|---|
| **% end-of-term-examination:** | 50 |
| **% of continuous assessment (assigments, laboratory, practicals…):** | 50 |

## BASIC BIBLIOGRAPHY

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

 - Durá Peiró, J.M. y López Cuñat, J.  Fundamentos de Estadística. Estadística descriptiva y modelos probabilísticos para la Inferencia, Ed. Ariel. 1992.
 - Lipschutz, S. y Schiller, J. Introducción a la Probabilidad y Estadística, Mc Graw-Hill. 2001.

 - Mendenhall, Scheaffer y Wackerly Estadística matemática con Aplicaciones, Ed. Grupo editorial Iberoamericana. 1986.
 - Peña, D. Introducción a la Estadística, Ed. Alianza Editorial. 2002.

## ADDITIONAL BIBLIOGRAPHY

 - Durret, R. The Essentials of Probability, Duxbury Press. 1994.

 - Grimmett, G. y D. J. A. Welsh.  Probability: An introduction., Oxford University Press, 2003