

## SUBJECT TEACHING GUIDE

### G1903 - Advanced Statistics

#### Double Degree in Physics and Mathematics

#### Degree in Mathematics

#### Degree in Mathematics

Academic year 2024-2025

1. IDENTIFYING DATA			
Degree	Double Degree in Physics and Mathematics Degree in Mathematics Degree in Mathematics		Type and Year Optional. Year 5 Optional. Year 4
Faculty	Faculty of Sciences		
Discipline	Subject Area: Further Probability and Statistics Mention in Pure and Applied Mathematics		
Course unit title and code	G1903 - Advanced Statistics		
Number of ECTS credits allocated	6	Term	Semester based (1)
Web			
Language of instruction	English	Mode of delivery	Face-to-face

Department	DPTO. MATEMATICAS, ESTADISTICA Y COMPUTACION		
Name of lecturer	ALICIA NIETO REYES		
E-mail	alicia.nieto@unican.es		
Office	Facultad de Ciencias. Planta: + 1. DESPACHO (1041)		
Other lecturers	JUAN ANTONIO CUESTA ALBERTOS		

### 3.1 LEARNING OUTCOMES

- The students should understand the main problems of Multivariate Statistics, with special emphasis on classification techniques (Supervised Automatic Learning), and handle the associated statistical techniques. An introduction to the multidimensional normal distribution is also included.

The basic principles of the Game and Decision Theory and the Bayesian Statistics will also be presented .

#### 4. OBJECTIVES

The course has two well-defined parts. The first is more theoretical: it includes the analysis of the multivariate normal distribution. The second is more practical and focuses on solving the most common problems of Multivariate Statistics.

#### 6. SUBJECT PROGRAM

##### CONTENTS

1	MULTIVARIATE STATISTICS. Introduction. Principal Component Analysis. Factorial analysis. Cluster analysis. Multidimensional Scaling. Discriminant Analysis (Automatic Supervised Learning)
2	MULTIDIMENSIONAL NORMAL DISTRIBUTION Characterization. Characteristic and density function. Cramer-Wold theorem. Multidimensional Central Limit Theorem

#### 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
It will be based on the work of the student in class.	Others	No	No	40,00
The final evaluation is an exam. If the students agree, and the size of the group allows for it, it will be substituted by projects.	Written exam	Yes	Yes	60,00
TOTAL				100,00
Observations				
Observations for part-time students				
The evaluation of part-time students will follow the same rules as regular students.				

#### 8. BIBLIOGRAPHY AND TEACHING MATERIALS

##### BASIC

CUESTA ALBERTOS, J.A. Análisis Multivariante. Universidad de Cantabria, 2021.  
 FERGUSON, T.S. Mathematical Statistics. Academic Press, 1967.  
 LINDGREN, B.W. Statistical Theory. Mc. Millan, 1968.  
 MANLY, B. Multivariate Statistical Methods. Chapman and Hall, 1986.  
 RAO, C.R. Linear Statistical Inference and its Applications. Wiley, 1973.  
 WILLIAMS, D. Weighing the Odds : A Course in Probability and Statistics. Cambridge University Press, 2001.