SUBJECT TEACHING GUIDE

G1903 - Advanced Statistics

Double Degree in Physics and Mathematics
Degree in Mathematics

Academic year 2023-2024

1. IDENTIFYING DATA				
Degree	Double Degree in Physics and 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 (2)	
Web				
Language of instruction	English		Mode of delivery	Face-to-face

Department	DPTO. MATEMATICAS, ESTADISTICA Y COMPUTACION
Name of lecturer	ALICIA NIETO REYES
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Other lecturers	

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 Decission Theory and the Bayesian Statistics will also be presented .

4. OBJECTIVES

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

6. COURSE ORGANIZATION

CONTENTS	
1	MULTIVARIATE STATISTICS. Introduction. Principal Component Analysis. Factorial analisys. Cluster analysis. Multidimensional Scaling. Discriminant Analysis (Automatic Supervised Learning)
2	DECISION THEORY Preliminary. Introduction to game and decision theory. Decision functions. Randomization. Minimax principle. Bayes principle. Admissibility
3	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 would be based on the resolution of a series of sets of problems (some of them theoretical and some of them consisting of the analysis of some data sets). It weights 40% in the final grade	Work	No	No	40,00
The final assessment will contain two parts: one theoretical and one practical, both with the same weight. Although the work of the continuous assessment is not recoverable, those students who wish to do so may only take the final assessment which, in th	Written exam	Yes	Yes	60,00
TOTAL				100,00

Observations

The final evaluation will consist of two parts: theory and practice; both with the same weight.

Students who wish may complete only the final exam. In this case, it will account for 100% of its rating. To this, it suffices to state its desire in writing before the start of the final evaluation.

Observations for part-time students

Part-time students must say if they choose to carry out the continuous assessment or perform only the final exam. In this case, the exam will account for 100% of their rating.

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.