SUBJECT TEACHING GUIDE

G1894 - Advanced Probability

Double Degree in Physics and Mathematics
Degree in Mathematics

Academic year 2022-2023

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	G1894 - Advanced Probability			
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	

3.1 LEARNING OUTCOMES
- To have mastered advanced tools of the probability theory

4. OBJECTIVES
To master the key tools of the probability theory

6. COURSE ORGANIZATION

	CONTENTS
1	THE STRONG LAW OF LARGE NUMBERS. Etemadi□'s proof of the Strong Law of Large Numbers. Glivenko-Cantelli theorem.
2	CONVERGENCE IN DISTRIBUTION. Relation to Convergence in Probability. Skorohod□s representation theorem. Weak Convergence. Tightness of a family of probability measures. Helly's selection theorem.
3	CHARACTERISTIC FUNCTIONS. Definition and properties. Taylor expansion for characteristic functions . Inversion Theorem. The Continuity Theorem.
4	THE CENTRAL LIMIT THEOREM. The Central Limit Theorem for an independent sequence of random variables having the same distribution. Applications central limit theorem.
5	STOCHASTIC PROCESSES. Kolmogorov's existence theorem
6	BROWNIAN MOTION. Definition. Properties of Brownian motion paths. The Strong Markov Property. Law of the iterated logarithm
7	Tutorial
8	Final exam

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
There will be a mid-term exam without the use of the student's notes.	Written exam	No	Yes	40,00
There will be a final exam without the student's notes.	Written exam	Yes	Yes	60,00
TOTAL				100,00

Observations
The final exam will be the same for any student that takes part in it. However, it will simultaneously be the retake exam of those students that did not pass the mid-term exam. In the case the group agrees and its size allow for it, the exams can be substituted by writing papers in the subject topic.

Observations for part-time students
The assessment of part-time students follows the same rules as the one of full-time.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC
BILLINGSLEY, P.(1986) Probability and Measure. Wiley. BREIMAN, L.(1968) Probability. Addison Wesley.