SUBJECT TEACHING GUIDE

365 - Simulation Techniques and Sampling Algorithms

Master's Degree in Mathematics and Computing

Academic year 2026 - 2027

1. IDENTIFYING DATA					
Degree	Master's Degree in Mathematics and Computing			Type and Year	Optional. Year 1
Faculty	Faculty of Sciences				
Discipline	STATISTICS				
Course unit title and code	365 - Simulation Techniques and Sampling Algorithms				
Number of ECTS credits allocated	3	Term		Semester based (2)	
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. MATEMATICAS, ESTADISTICA Y COMPUTACION
Name of lecturer	MIGUEL MARTINEZ ANTON
E-mail	miguel.martinezanton@unican.es
Office	
Other lecturers	

3.1 LEARNING OUTCOMES

Understand the usefulness of the simulation techniques and sampling algorithms covered in class in order to apply them to simulated or real data.

4. OBJECTIVES

Since World War II and the development of nuclear testing, the use of data simulation techniques applied to real-world phenomena has increased significantly. This rise is due to the major advantages they offer, such as cost reduction, ethical considerations in certain experiments, or the impossibility of conducting them. The aim is to understand some of these techniques, as well as the existing sampling and resampling algorithms.

6. COURSE ORGANIZATION

CONTENTS

1	Introduction to random data simulation and pseudorandom numbers generation.
2	Analysis simulation results. Convergence.
3	Simulation of discrete and continuous variables.
4	Monte Carlo methods
5	Resampling methods. Bootstrap method.

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessment	%
Continuous assessment	Others	No	No	40,00
Final assessment	Work	No	Yes	60,00
TOTAL				100,00
Observations				
Observations for part-time students				
The assessment of part-time students will follow the same rules as those for the rest of the students.				

8. BIBLIOGRAPHY AND TEACHING MATERIALS
BASIC
An Introduction to the Bootstrap / Bradley Efron, Robert J. Tibshirani. Editorial: Chapman Hall, cop. 1993.
Simulation and the Monte Carlo method / Reuven Y. Rubinstein, Dirk P. Kroese. Editorial: Wiley-Interscience, cop. 2008.
Probability and Measure / Patrick Billingsley. Editorial: John Wiley, cop. 1995.