

SUBJECT TEACHING GUIDE

359 - Probability and Statistics

Master's Degree in Mathematics and Computing

Academic year 2023-2024

| 1. IDENTIFYING DATA | | | | | |
|----------------------------------|--|------------------|--------------------|------------------|--------------------|
| Degree | Master's Degree in Mathematics and Computing | | | Type and Year | Compulsory. Year 1 |
| Faculty | Faculty of Sciences | | | | |
| Discipline | | | | | |
| Course unit title and code | 359 - Probability and Statistics | | | | |
| Number of ECTS credits allocated | 3 | Term | Semester based (1) | | |
| Web | | | | | |
| Language of instruction | Spanish | English Friendly | Yes | Mode of delivery | Face-to-face |

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|------------------|---|--|--|--|--|
| Department | DPTO. MATEMATICAS, ESTADISTICA Y COMPUTACION | | | | |
| Name of lecturer | JUAN ANTONIO CUESTA ALBERTOS | | | | |
| E-mail | juan.cuesta@unican.es | | | | |
| Office | Facultad de Ciencias. Planta: + 1. DESPACHO PROFESORES (1037) | | | | |
| Other lecturers | ALICIA NIETO REYES | | | | |

3.1 LEARNING OUTCOMES

- To know, comprehend and be able to apply advance techniques of Probability and Statistics in professional situations and in doing research in Mathematics and Computation.

4. OBJECTIVES

Provide the students with the proficiency and techniques required for the professional environment and the research in probability and statistics.

| 6. COURSE ORGANIZATION | |
|------------------------|--|
| CONTENTS | |
| 1 | Advance probability (inequalities of Hoeffding, Jensen and Tchevichev, strong law of large numbers, Kullback-Leibler divergence) |
| 2 | Estimation with noise and statistical data depth. |
| 3 | Nonparametric hypothesis testing (permutation methods and bootstrap) |
| 4 | Combination of hypothesis tests (FDR and FDR with dependency). |
| 5 | Sequential analysis. |
| 6 | Stochastic processes (goodness of fit, Markov models and hidden Markov models). |
| 7 | Monte Carlo methods. |

| 7. ASSESSMENT METHODS AND CRITERIA | | | | |
|--|------|-------------|-----------|--------|
| Description | Type | Final Eval. | Reassessn | % |
| Continuous evaluation | Work | Yes | Yes | 100,00 |
| TOTAL | | | | 100,00 |
| Observations | | | | |
| Each student will write a paper related to the topic studied in class; it can be either of bibliographic or research nature. | | | | |
| Observations for part-time students | | | | |
| The evaluation of students at part time follows the same criteria than of students at full time. | | | | |

| 8. BIBLIOGRAPHY AND TEACHING MATERIALS |
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| BASIC |
| Probability and Statistics (4th Edition) 2011. Morris H. DeGroot , Mark J. Schervish |