Universitat Autònoma de Barcelona

2023/2024

Probability

Code: 104847
ECTS Credits: 6

Degree	Type	Year	Semester
2503852 Applied Statistics	FB	1	2

Contact

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Teaching groups languages

You can check it through this link. To consult the language you will need to enter the CODE of the subject. Please note that this information is provisional until 30 November 2023.

Prerequisites

Calculus 1 and Introduction to Probability.

Objectives and Contextualisation

Probability is a branch of Mathematics that has multiple applications in practically all areas of science and techno

It is also the language of inferential statistics. By this reason, this is one of the fundamental subjects of the Degre

In this second course, it is intended to deepen in some of the subjects started in the Introduction to Probability co

such as simulation of random variables and Markov chains.

Competences

- Calculate and reproduce certain mathematical routines and processes with agility.

- Critically and rigorously assess one's own work as well as that of others.
- Make efficient use of the literature and digital resources to obtain information.
- Select and apply the most suitable procedures for statistical modelling and analysis of complex data.
- Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
- Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
- Use quality criteria to critically assess the work done.

Learning Outcomes

1. Critically assess the work done on the basis of quality criteria.
2. Distinguish deterministic models from probabilistic-statistical models.
3. Make effective use of references and electronic resources to obtain information.
4. Reappraise one's own ideas and those of others through rigorous, critical reflection.
5. Recognise the usefulness of mathematical methods (calculus, algebra, numerical methods) for probabilistic modelling.
6. Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
7. Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
8. Use probabilistic models to describe data in contexts of uncertainty and deduce behaviour patterns.

Content

1. Simulation of random variables.

2. Random vectors. Basic definitions. Discrete random vaectors. Covariance, correlation. Independents random variables.

3. Probability generation and moment geneerating functions.

4. Convergence of rnadom sequences. Convergence in probability, in quadratic mean, almost sure. convergence in distribution.

5. Laws of Large Numbers. Central Limit Theorem. Applications..

6. Markov chains with finite set of states.

Methodology

There will be three types of face-to-face activities: theory classes, problem classes and practical classes. In theory classes the concepts and results that form the heart of the subject will be developed. A collection of problem lists will be edited for class work of problems that students should have worked on before. The practices will be in the computer rooms and specialized software will be used, such as R. Attendance to the practical classes is mandatory.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Classes of problems	18	0.72	4, 1, 2, 6, 5, 3
Classes of theory	26	1.04	4, 1, 2, 7, 5, 8
Type: Supervised			
Classes of practice	8	0.32	4, 1, 2, 7, 6, 5
Type: Autonomous			
Personal study	82	3.28	4, 2, 5, 3, 8

Assessment

The continuous evaluation will consist of two partial exams (eliminatory) with a weight of 40% each one and the evaluation of the practices that will represent 20%.

In the evaluation of the practices, the delivery of several works will be evaluated, as well as the completion of an exam.

The recoverable part will correspond to the partial exams.

To pass the subject, a minimum grade of 3.5 is required in the partials and practices.

Single evaluation

The single evaluation will be a test of synthesis of the competences of both partials, based on: (1) An exam with theory questions and problems (weight: 80%). (2) A practice test in front of the computer (weight: 10%). (3) The delivery of scheduled tasks that are indicated, with the possibility that the faculty ask the student to explain details of these deliveries (weight: 10%).

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Continued evaluation	100%	12	0.48	4, 1, 2, 7, 6, 5, 3, 8
Exam of recuperation	80%	4	0.16	4, 1, 2, 7, 6, 5, 3, 8

Bibliography

X. Bardina. *Càlcul de probabilitats.* Materials UAB, 139.

M.H. de Groot. *Probabilidad y estadística*. Addison-Wesley Iberoamericana.

W. Mendenhall et al. *Estadísitica Matemática con aplicaciones*. Grupo editorial Iberoamérica.

K.L. chung. *Teoría elemental de la probabilidad y los procesos estocásticos*. Ed. Reverté.

S.M. Ross. *A First course in probability*. Ed. MacMillan.

Software

We will use statistical software R.