

| Degree programme   | Type | Course |
|--------------------|------|--------|
| Applied Statistics | FB   | 1      |

## Contact lecturer

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## Prerequisites

Calculus 1 and Introduction to Probability.

## Group languages

You can consult this information at the [end](#) of the document.

## Objectives

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

It is also the language of inferential statistics. By this reason, this is one of the fundamental subjects of the Degree in Applied Statistics.

In this second course, it is intended to deepen in some of the subjects started in the Introduction to Probability course and to present new topics such as simulation of random variables.

## Learning outcomes

- KM10 (Describe the characteristics of the distribution and density functions of random variables.)  
Describe the characteristics of the distribution and density functions of random variables.

## Contents

1. Generating random variables based on uniform random numbers.

2. Random vectors:

- Expectation of a function of a random vector. Covariance and correlation.
- Independent random variables.
- Conditional expectation.
- Computations in the discrete case.

3. The moments of a random variable and the moments' generating function. Properties and applications.

4. Convergence of a sequence of random variables: almost-sure, in probability and in distribution. Relations and properties.

5. The Laws of Large Numbers and de Central Limit Theorem. Applications.

### Learning activities and methodology

| Title               | Hours | ECTS | Learning outcomes |
|---------------------|-------|------|-------------------|
| Personal study      | 82    | 3.28 |                   |
| Classes of practice | 8     | 0.32 |                   |
| Classes of theory   | 26    | 1.04 |                   |
| Classes of problems | 18    | 0.72 |                   |

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.

### Assessment

#### Continuous assessment activities

| Title                | Weight | Hours | ECTS | Learning outcomes |
|----------------------|--------|-------|------|-------------------|
| Exam of recuperation | 80%    | 4     | 0.16 | KM10              |
| Continued evaluation | 100%   | 12    | 0.48 | KM10              |

#### Continuous Assessment

Two midterm examinations will be held: the first in the middle of the semester and the second at the end of the semester. Each examination will account for 40% of the final grade.

Three laboratory sessions will be carried out throughout the course. Students will be required to submit a report for each laboratory session. The combined grade for these reports will account for 10% of the final grade.

At the end of each of the theory sessions, a Woodlap activity will be conducted. The score for each activity will be the percentage of correct answers. The grade corresponding to these activities will be computed as the average of the nine highest scores obtained during the course and will account for 10% of the final grade.

## Single Assessment

Students opting for the single assessment system will complete the following activities on the date scheduled for the final examination:

- A theory and problem-solving examination, accounting for 80% of the final grade.
- A practical examination, accounting for 10% of the final grade.
- A Wooclap activity, accounting for 10% of the final grade.

## Bibliography

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

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

W. Mendenhall et al. *Estadística 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

R Core Team. *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing, Vienna, Austria. <https://www.r-project.org/>

## Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this [link](#). To access the information, you will need to enter the course CODE

| Type of teaching              | Group | Language | Semester        | Shift     |
|-------------------------------|-------|----------|-----------------|-----------|
| (TE) Theory                   | 1     | Catalan  | second semester | afternoon |
| (PAUL) Classroom practices    | 1     | Catalan  | second semester | afternoon |
| (PLAB) Practical laboratories | 1     | Catalan  | second semester | afternoon |
| (PAUL) Classroom practices    | 2     | Catalan  | second semester | afternoon |
| (PLAB) Practical laboratories | 2     | Catalan  | second semester | afternoon |