UAB
Universitat Autònoma de Barcelona

Introduction to Probability

Code: 104846
ECTS Credits: 6

2025/2026

Degree	Type	Year
Applied Statistics	FB	1

Contact

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Teachers

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

There are no prerequisites except to take simultaneously the course Calculus 1, or to know already its contents.

To a lesser degree, it may also be convenient to take the course Computer Tools for Statistics at the same time, or to have basic knowledge of the R programming language.

Objectives and Contextualisation

What do have in common a lottery draw, a clinical trial to experimentally assess the efficacy and/or safety of a new medical treatment, weather forecasting for rain in a certain area, inventory management for a company, gene transmission from parents to children, estimating the population size of whales, an epidemiological study on the incidence of a certain disease, inspecting product lots produced by a company to verify their quality, an experiment to study the effect of pressure and temperature on the outcome of a certain chemical reaction, or the effect of using different fertilizers on the agricultural production of a farm ... ?

They are real situations in which chance plays a role.

To study them and draw reliable conclusions, we need to use an appropriate mathematical model. Probability is the mathematical theory that allows us to model random phenomena, that is, situations where chance is involved, and it is fundamental in Statistics. In practical applications, it is about finding the best possible

probabilistic model for a given real situation and, by using it correctly, extracting valuable information, knowledge, and useful conclusions.

The aim of this course is to introduce the theory of Probability. The topics we will cover will be expanded upon and deepened in the "Probability" course of the second semester.

Learning Outcomes

1. CM01 (Competence) Find suitable probabilistic models in a specific real situation to gain useful knowledge and conclusions.
2. KM03 (Knowledge) Select mathematical models for situations of uncertainty.
3. SM01 (Skill) Apply the concepts studied to calculate the extreme points of functions and moments of random variable distributions.
4. SM04 (Skill) Resolve problems associated with the extreme points of functions of one and several variables, and the calculation of moments.

Content

1. Probabilistic models.

2. Conditioned probability.

3. Random variables.

4. Mathematical expectation and variance.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Problems in the classroom	18	0.72	
Theory in the classroom	26	1.04	
Type: Supervised			
Practical sessions	8	0.32	
Type: Autonomous			
Personal work	91	3.64	

In-person activities will consist of theory classes, problem-solving sessions, and computer-based practicals. Concepts and examples will be introduced progressively, and, when appropriate, exercises will be worked on or computer tools will be used.

The Moodle classroom on the Virtual Campus will serve as the main communication channel between the teaching staff and students. All questions-whether about course logistics or content-that may be of interest to other students should be raised either in class or through the General Forum on Moodle. Personal or individual matters will be addressed privately or via email, which must always be sent from the institutional adress *@autonoma.cat*.

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

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Assessment Test with R	0.15	1	0.04	CM01, KM03, SM01, SM04
Intermediate tests	0.85	6	0.24	CM01, KM03, SM01, SM04

Assessment Criteria

- Two midterm exams covering both theory and problem-solving: 85% of the final grade
- Computer-based practical exam: 15% of the final grade

To pass the course, students must:

- Attain an average of 5.0 out of 10 on the theory and problem-solving exams, with no individual score below 4.0
- Achieve an overall average of 5.0 out of 10, which will constitute the final course grade

Grades that do not meet these requirements may be reviewed on a case-by-case basis.

Each exam will have a resit opportunity ("recuperation" as per UAB's official terminology). Attending the resit automatically invalidates the original exam grade. Practical exams and submissions are not eligible for resit.

A student will be considered eligible for assessment if they have submitted assignments or completed exams totaling at least 50% of the course weight. Otherwise, they will appear on the transcript as "Not Assessable."

Honors distinctions (Matrícula d'Honor) will not consider grades from

Single Assessment Option

Students who opt for the single assessment modality will complete one final exam and submit the required assignments on the date of the second midterm exam. Specific details will be arranged individually with the students concerned.

Bibliography

BASIC BIBLIOGRAPHY:

Bardina, Xavier. Càlcul de Probabilitats. Servei de Publicacions UAB, 2004.

Julià, Olga; Márquez, David; Rovira, Carles i Sarrà, Mónica. Probabilitats: Problemes i més problemes. Publicacions i edicions de la Universitat de Barcelona, 2005.

Software

We will use the R programming language.

Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this link. To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	1	Catalan	first semester	afternoon
(SEM) Seminars	1	Catalan	first semester	afternoon
(SEM) Seminars	2	Catalan	first semester	afternoon
(TE) Theory	1	Catalan	first semester	afternoon