UAB
Universitat Autònoma de Barcelona

Statistics

2026/2027

Code: 103816
Credits: 6

Degree programme	Type	Course
Aeronautical Management	FB	1

Contact lecturer

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Teaching staff

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Group languages

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

Prerequisites

There are no official prerequisites.

Objectives

The main objective of the course is to provide the foundations of scientific thinking, as well as the basic methodological tools of probability and statistics. It aims to develop the ability to collect, analyze, and interpret relevant data in order to make scientifically grounded tactical decisions that enhance safety, economic efficiency, and sustainability in the field of aeronautical management.

With the goal of transforming raw data into useful information-aimed at optimizing resources, reducing costs, and improving operational safety-the course will teach how to process and summarize large volumes of sector data using graphs and indicators. It will also introduce the use of probability to carry out simulations that help understand and manage unpredictable situations, such as weather conditions or equipment failures.

In addition, statistical inference will be addressed to draw reliable conclusions about an entire sector or market based on specific data samples (for example, to evaluate the efficiency of a new boarding process). Likewise, models will be developed to identify relationships between key factors, obtain robust conclusions, and anticipate future trends.

All this process will be supported by widely used industry tools such as R, Power BI, and Excel, which will facilitate the automation of numerical analysis and data processing. This will prepare students to successfully face the challenges of *Big Data in the aeronautical field*.

Learning outcomes

- KM01 (Identify the mathematical concepts necessary in the processes of systems in the aeronautical sector.) Identify the mathematical concepts necessary in the processes of systems in the aeronautical sector.
- SM01 (Use basic mathematical language to interpret those texts that use it to convey ideas and methods.) Use basic mathematical language to interpret those texts that use it to convey ideas and methods.
- SM04 (Solve problems in calculating probabilities.) Solve problems in calculating probabilities.
- SM05 (Interpret graphical representations of data and functions.) Interpret graphical representations of data and functions.
- SM06 (Deduce the properties of a population from a sample.) Deduce the properties of a population from a sample.

Contents

1. Descriptive statistics

1.1. Descriptive study of a variable

1.1.1. Qualitative: Frequency table; and graphs: pie chart, bar chart and others

1.1.2. Quantitative: Statistical measurement table: mean, deviation; and thanks: bar chart, histogram and boxplot

1.2. Descriptive study of two variables

1.2.1. Qualitative: Contingency table and graph of bars grouped by category

1.2.2. Quantitative: Correlation coefficient and scatter graph

2. Probability

2.1. Definition

2.2. Conditional probability

2.3. Event Independence

3. Random variables

3.1. Discrete and continuous random variables

3.2. Probability and distribution functions

3.3. Position, dispersion and shape measures: expected value, moments, variance and others

3.4. Notable distributions: Binomial, Poisson, Uniform, Exponential and Normal.

3.5. Bivariate distributions and independence between random variables

4. Random variable function distributions and approximations

4.1. Sample and population

4.2. Distribution of the mean, variance and quasivariance in normal random variables

4.3. Random variable function approaches

4.3.1. Convergence in probability and distribution

4.3.2. Law of large numbers and Monte Carlo Method

4.3.3. Central Limit Theorem

4.3.4. Monte Carlo simulation

5. Statistical inference

5.1. Point estimator and confidence intervals.

5.2. Hypothesis contrasts for a population: average, variance and proportion

5.3. Hypothesis contracts for two populations: paired or independent populations

5.4. Xi-Square Contrasts

5.5. Variance Analysis

6. Linear Regression Model

6.1. Ordinary Minimum Square Estimator

6.2. Goodness of fit

6.3. Prediction with regression model

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Experimental classes	12	0.48	
Theoretical classes	30	1.2	
Individual tutoring	8	0.32	
Preparation for experimental works	10	0.4	
Study and resolution of problems	67	2.68	
Problem-solving classes	15	0.6	

The core of the learning process is the work carried out by students. Students learn by working, and the role of the teaching staff is to support this process by providing information, indicating sources where it can be found, and guiding the process so that learning can take place effectively. In line with these ideas, and in accordance with the objectives of the course, its development is based on the following activities:

Lectures

Students acquire the scientific and technical knowledge specific to the course by attending lectures and complementing them with personal study of the topics covered.

Problem-solving sessions and practical work

Problem-solving sessions and practical work are conducted in small groups of students with a dual purpose. On the one hand, they reinforce the scientific and technical knowledge presented in lectures, helping to complete understanding and deepen it through various activities, from solving problems to discussing practical cases. On the other hand, these sessions provide a forum for jointly discussing the development of the practical work, contributing the necessary knowledge to carry it out or indicating where and how it can be acquired.

The more practical component of this course is designed as a pathway to guide students through a statistics fieldwork project at each of its stages. It involves working on the different concepts introduced throughout the course using Excel spreadsheets and the statistical tools included in the software.

Use of Artificial Intelligence

In this course, the use of Artificial Intelligence (AI) technologies is allowed as support during practical sessions. However, the analysis and final resolution must be the responsibility of each student, as well as the critical reflection on the results obtained with the use of AI. Under no circumstances may AI be used in in-person assessed activities. Lack of transparency in the use of AI in an assessed activity will be considered a breach of academic integrity and may result in partial or total penalties in the grade, or more serious sanctions in severe cases.

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
Evaluation of the lab practical sessions (P)	30%	2	0.08	SM05, SM06
Delivery of solved problems	20%	4	0.16	KM01, SM01, SM04
Final exam / Reassessment (E)	50%	2	0.08	KM01, SM01, SM04, SM05, SM06

In the assessment, the scientific and technical knowledge of the subject acquired by the students will be evaluated, as well as their capacity for analysis and synthesis, critical reasoning, and the application of their knowledge to the resolution of practical cases.

This course does not provide for a single-assessment system.

Assessment will be continuous and will pursue several key objectives: to monitor the teaching-learning process, allowing both students and teaching staff to understand the level of competence achieved and, where possible, to correct any deviations; and to encourage sustained effort rather than last-minute overexertion, which is often ineffective.

Continuous Assessment

Continuous assessment consists of the submission of problem sets completed on three different days during the course, an evaluation of the practical sessions, and a final exam.

The final grade for the course will be based on the problem submissions (grade C), the practical assessment (grade P), and the final exam (E1). Grade C accounts for 20%, P for 30%, and the final exam E1 for 50% of the overall grade.

Using the grades C, P, and E1, the final course grade (N) is calculated as follows:

$N = 0.50 \times E1 + 0.20 \times C + 0.30 \times P$

Resit and/or Improvement of the Exam Grade

The course is passed if N is greater than or equal to 5 and, at the same time, both E1 and P are greater than or equal to 5. Otherwise, or if a student wishes to improve their grade, there is the option to improve the exam grade by taking a resit exam (E2). The final grade is then calculated as:

NF = 0.50 × max(E1, E2) + 0.20 × C + 0.30 × P

Observations

Grades C and P from continuous assessment are not recoverable.

A student is considered to have sat the examination session if they take either of the two exams (E1 or E2). Otherwise, the result will be recorded as "Not attended", even if the student has obtained some continuous assessment grades (C and/or P).

Taking the resit exam E2 implies that the maximum possible final grade for the course is 7.

To obtain a distinction with honours ("Matrícula de Honor"), it is recommended to achieve an excellent result in all three components.

"Not Assessable" Grade

Students who have only participated in assessment activities that together account for 50% or less of the total will receive a "Not assessable" grade.

Without prejudice to any other disciplinary measures deemed appropriate, and in accordance with current academic regulations, any irregularities committed by students that may lead to a modification of an assessment grade will be marked with a zero. Therefore, copying or allowing copying in any practical work or other assessment activity will result in a grade of zero for that activity and, if it is necessary to pass in order to pass the course, the entire course will be failed.

Such activities will not be eligible for reassessment and, therefore, the course will be automatically failed with no possibility of recovery within the same academic year.

Exam dates and deadlines for submitting assignments will be published on the virtual campus and may be subject to change for organizational reasons. Any changes will always be communicated via the virtual campus, as it is the usual platform for communication between teaching staff and students.

Bibliography

Bardina, X., Farré, M.: Estadística descriptiva. Manuals UAB, 2009

Delgado, R.: Probabilidad y Estadística para ciencias e ingenierías. Delta, Publicaciones Universitarias. 2008.

Peña, D.: Estadística. Fundamentos de estadística. Alianza Universidad. 2001.

Silvey, S.D.: Statistical Inference. Chapman&Hall. 1975.

Novales, A.: Econometria. McGraw-Hill 2000

Software

The most practical part of the course is carried out using industry-leading software: Excel, R, and PowerBI.

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	11	Catalan	first semester	afternoon

(PAUL) Classroom practices	11	Catalan	first semester	afternoon
(PAUL) Classroom practices	12	Catalan	first semester	afternoon
(PLAB) Practical laboratories	21	Catalan	first semester	afternoon
(PLAB) Practical laboratories	22	Catalan	first semester	afternoon
(PLAB) Practical laboratories	23	Catalan	first semester	afternoon