

Degree programme	Type	Course
Applied Statistics	OB	2

Contact lecturer

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Prerequisites

Knowledge in:

- Computer Tools for Statistics
- Exploratory Data Analysis
- Introduction to Programming
- Data Retrieval and Storage
- Statistical Inference
- Sampling and Survey Design

Group languages

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

Objectives

The objectives of the subject are to learn to design and analyze experiments using the following techniques:

- Analysis of the variance of one and several factors.
- Analysis of the variance with blocks, nested factors, fractional designs with interaction
- Analysis of Covariance and other special designs.

The subject is also intended to familiarize students with the use of SAS software.

Learning outcomes

- CM09 (Assess the suitability of the models with the correct use and interpretation of indicators and graphs.) Assess the suitability of the models with the correct use and interpretation of indicators and graphs.
- KM12 (Provide the experimental hypotheses of modelling, considering the technical and ethical implications involved.) Provide the experimental hypotheses of modelling, considering the technical and ethical implications involved.
- SM12 (Interpret the results obtained to formulate conclusions about the experimental hypotheses.) Interpret the results obtained to formulate conclusions about the experimental hypotheses.
- SM14 (Use graphs to visualise the fit and suitability of the model.) Use graphs to visualise the fit and suitability of the model.

Contents

0: Principles of Experimental Design.

- Introduction
- Objective
- Guidelines and recommendations

1: ANOVA 1 Fully Randomized Factor

- Variance decomposition
- Model and ANOVA Table
- Contrasts
- Separation of Means: pairwise comparisons and correction for multiple comparisons

2: ANOVA 1 Block

- Fixed / Random Factor
- Variance decomposition
- Model and ANOVA Table

3: ANOVA 1 Factor with Complete Blocks

- Model and ANOVA Table
- Verification of the model
- Cross-Over Studies
- Latin squares

4: ANOVA 2 Factors

- Model and ANOVA Table
- Separation of Means: pairwise comparisons and correction for multiple comparisons
- ANOVA 2 Factors with Interaction

5: Other ANOVA models

- ANOVA with Sub-Replicates
- ANCOVA
- ANCOVA with Interactions

6: Other models

- Basic concepts of Screening Design
- Basic Concepts of Factorial Design 2k
- Basic concepts of the Surface Response method

Software

- R
- SAS System

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Theory	40	1.6	CM09, KM12
Personal working	20	0.8	CM09, KM12, SM12, SM14
Pràctiques	25	1	CM09, KM12, SM12, SM14
Report	20	0.8	SM12, SM14

Concepts related to the design of studies and experiments will be exposed in theoretical sessions.

These sessions will be complemented by practical sessions, where datasets will be analyzed using statistical software.

All the above concepts will be applied through an experimental project that can be carried out in groups.

Regarding the use of artificial intelligence tools, they are only permitted for reviewing the text of the reports, both for the practical sessions and the final project.

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
Final exam	50	15	0.6	CM09, KM12, SM12, SM14
Mid-term exam	20	10	0.4	CM09, KM12, SM12, SM14
Practical Sessions	10	10	0.4	SM12, SM14
Report	20	10	0.4	CM09, KM12, SM12, SM14

Continuous Assessment

Assessment takes place throughout the course and will consist of four parts: a mid-term exam (20%), assignments submitted during problem-solving sessions and/or computer-based practical activities (10%), the final course assignment (20%) and the final exam (50%). The course mark will be $N = 0.20 \cdot \text{Mid-term_Exam} + 0.1 \cdot \text{Practical_Work} + 0.2 \cdot \text{Report} + 0.5 \cdot \text{Final_Exam}$, provided that each individual mark is at least 3 out of 10. Otherwise, that mark will be treated as 0 when calculating N.

Only students who have achieved a minimum of 3 in the final mark as the subject may sit the resit examination, which covers only the theory section; that is, their final mark will be $N = 0.7 \cdot \text{Resit_Exam} + 0.1 \cdot \text{Practical_Work} + 0.2 \cdot \text{Report}$. Marks for the assignments and the report are NOT eligible for resit.

Students who have taken part in any assessed activity will be considered to have been assessed. Otherwise, they will be recorded in the register as 'Not Assessed'.

Single Assessment:

The students who chose the single assessment modality must take a final test that will consist of an exam in which there may be questions of theory and problem-solving (70%) and a practice exam that may be carried out using a computer if deemed appropriate (30%). The final grade will be: $N = 0.7 \text{Theory_Exam} + 0.3 \text{Practical_Exam}$, provided that each grade is at least 3 out of 10. Otherwise, that component will be counted as 0 in the calculation of N. This test will be carried out on the same day, time, and place in which the final exam for the continuous assessment option. Ais carried out. Anyone who misses the test without a valid excuse will be classified as 'Not Assessed'.

Students that achieve a minimum mark of 3 in the final mark can take the resit examination on the same day, at the same time, and in the same location as the other students in the course in the same format as the previous test.

If $N \geq 5$, the course is passed with a final mark $NF = N$.

Under no circumstances may the resit examination be used to improve the grade of a course that has already been passed.

General considerations on assessment

Based on the instructions of the Vice-Rector for Studies and Quality at UAB, sanctions and the use of AI are regulated as follows:

Any irregularity in an assessment activity (academic fraud, plagiarism, or misuse of AI, unless such use is explicitly authorized in the course guide) that may lead to a significant change in the grade will result in that activity being graded as 0. If the course guide establishes that obtaining a minimum grade in this assessment activity is an essential requirement to pass the course, or if multiple irregularities occur in the assessment activities of the same course, the final grade for the course will be 0. Additionally, a disciplinary procedure may be initiated against any student who commits any of these irregularities.

Bibliography

References

- Box, G. E., Hunter, J. S., & Hunter, J. S. (1993). *Estadística para investigadores*. Reverté.
- Peña, D. (1987). *Estadística: modelos y métodos*. Alianza.
- Steel, R. G. D., Torrie, J. H., & Dickey, D.A. (1997). *Principles and procedures of statistics, a biometrical approach*. McGraw-Hill
- Dean, A., & Voss, D. (Eds.). (1999). *Design and analysis of experiments*. New York, NY: Springer New York.
- Peña, D., & SÁNCHEZ DE RIVERA, J. (1989). *Estadística: Modelos y Métodos-Tomo I: Fundamentos*. Madrid: Alianza Universidad.
- Montgomery, D. C. (2017). *Design and analysis of experiments*. John Wiley & sons.

Software

SAS and R

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
(PLAB) Practical laboratories	2	Catalan	second semester	afternoon