

Degree programme	Type	Course
Applied Statistics	OB	3

Contact lecturer

Name : Amanda Fernandez Fontelo

Email : amanda.fernandez@uab.cat

Teaching staff

Roger Borrás Amoraga

Teaching staff (external to UAB)

Aureli Alabert

Group languages

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

Prerequisites

It is assumed that the student has acquired the competences of the previous courses in Statistics Inference, Probability, and Stochastic Processes, and that they have a good level with the R programming language.

Objectives

- Learn how to generate samples using a computer and apply it to the analysis of complex systems and process optimization.
- Learn resampling techniques in statistical inference and machine learning.

Learning outcomes

- KM15 (Identify simulation and resampling algorithms and techniques, and models for complex situations, fostering innovation in the field of statistics.) Identify simulation and resampling algorithms and techniques, and models for complex situations, fostering innovation in the field of statistics.
- SM15 (Solve unconventional inference problems using simulation and resampling techniques.) Solve unconventional inference problems using simulation and resampling techniques.

Contents

2. Permutation tests: Two-sample tests. Test with paired data. Correlation tests. Advanced examples.
4. Bootstrap and other resampling methods: Basic concepts. Estimations of standard error and bias. Parametric bootstrap. Non-parametric bootstrap. Methods to compute confidence intervals. Applications (linear and generalised-linear models, hypothesis testing, time series, ...).
6. Resampling for machine learning: Bagging. Boosting.
8. Simulation: Simulation of random variables and vectors. Discrete Event Simulations. Output analysis. Input modelling. Generation of random numbers.

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Personal study of the subject	48	1.92	
Classroom lectures (theoretical and practical)	50	2	KM15, SM15
Assignments	48	1.92	

The methodology will combine classroom lectures delivered by the teachers and practical work of the student with computers.

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
Simulation Assignments hand in	10%	0	0	KM15, SM15
Resampling assignments hand in	10%	0	0	KM15, SM15
Exam of Resampling	40%	2	0.08	KM15, SM15
Exam of Simulation	40%	2	0.08	KM15, SM15

Assessment Criteria

- Exams: 80% of the final grade
- Assignments: 20% of the final grade

To pass the course, students must:

- Achieve an average score of 5.0 out of 10 in the exams, with no individual score below 4.0

- Obtain an overall average of 5.0 out of 10, which will represent 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" in UAB's official terminology). Attending a resit automatically annuls the original exam grade. Assignments are not eligible for resubmission. Exams from different parts of the course may be scheduled on the same day within the same resit period.

A student will be considered eligible for evaluation if they have submitted assignments or taken exams covering at least 50% of the course weight, as indicated in the Evaluation Activities table. Otherwise, their status will appear as "Not Assessable."

Grades from the resit period will not be considered for the possible awarding of Honors Distinction ("Matrícula d'Honor").

Plagiarism or copying, whether in assignments or during exams, will be treated equally and will result in an automatic fail for the course.

Single Assessment:

Students who choose the single assessment modality will be evaluated through a single comprehensive exam covering all course content, including practicals. No assignments will be submitted. Part of the exam may include an oral component. If students pass the first sitting, no resit option will be available to improve the grade.

Use of AI

The use of Artificial Intelligence (AI) technologies is not permitted at any stage of this course. Any work that includes AI-generated content will be considered a breach of academic integrity and may result in a partial or total penalty to the activity's grade, or more severe disciplinary sanctions in cases of greater seriousness.

Irregularities in Assessment Activities

Any irregularity committed during an assessment activity (including academic fraud, plagiarism, or the improper use of AI) that may lead to a significant alteration of the student's grade will result in that assessment being graded as 0. If the course syllabus establishes that obtaining a minimum grade in that assessment is a mandatory requirement for passing the course, or if multiple irregularities are committed in the assessment activities of the same course, the final grade for the course will be 0. In addition, disciplinary proceedings may be initiated against any student who commits any of these irregularities.

Bibliography

- Law (2014) Simulation. Modelling and Analysis.
- James - Witten - Hastie - Tibshirani (2013) An introduction to Statistical Learning: with applications in R. Springer (Recurs electrònic UAB).
- Efron - Hastie (2016) Computer Age Statistical Inference. Cambridge University Press.

Software

During the course the relevant installation instructions for the software to be used will be given, at the appropriate time.

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
(PLAB) Practical laboratories	1	Catalan	second semester	afternoon