

**Advanced Modelling**

Code: 104865  
ECTS Credits: 6

**2024/2025**

Degree	Type	Year
2503852 Applied Statistics	OB	3

## Contact

Name: Ferran Torres Benitez

Email: ferran.torres@uab.cat

## Teachers

Jose Rios Guillermo

## Teaching groups languages

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

## Prerequisites

Prior knowledge of sufficient knowledge in both theoretical statistics (linear models, statistical inference, and probability) and applied statistical software management. Internships can be followed with R, SAS or Stata.

A sufficient level of English is required to understand scientific articles to apply modeling knowledge.

## Objectives and Contextualisation

Learn different modeling strategies for data analysis, both in terms of the theoretical aspect and its applications. Provide applied knowledge in terms of design, organization, implementation, supervision, analysis, interpretation and dissemination of results.

The general objectives of the subject are:

1. Know the basics for the application of different models
2. Understand criteria for selecting variables based on objectives
3. Acquire knowledge about the interpretation and implications of different models
4. Acquire and apply programming knowledge

## Learning Outcomes

1. CM09 (Competence) Assess the suitability of the models with the correct use and interpretation of indicators and graphs.
2. CM09 (Competence) Assess the suitability of the models with the correct use and interpretation of indicators and graphs.
3. CM10 (Competence) Modify the existing software if required by the statistic model, or create new software, if necessary.
4. KM12 (Knowledge) Provide the experimental hypotheses of modelling, considering the technical and ethical implications involved.
5. KM12 (Knowledge) Provide the experimental hypotheses of modelling, considering the technical and ethical implications involved.
6. SM12 (Skill) Interpret the results obtained to formulate conclusions about the experimental hypotheses.
7. SM14 (Skill) Use graphs to visualise the fit and suitability of the model.

## Content

- Basic concepts in statistics applied to modeling
- Obtaining, supervising and preparing the data
- Effect measures and related models. Selection of models depending on the design
- Models used in studies with confounding factors and effect modifiers. Role of different (co) variables
- Application of multivariate and regression logistic regression models
- Propensity score and other alternatives for control of confounding factors
- Adjusted meta-analysis for individual data
- Adjusted repeated measurements with fixed and random effects

There will be practical examples in each block and students will have to deliver the practices done in groups

## Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Practical lecture	50	2	
Theory lecture	50	2	

### Supervised activities

- **Theoretical classes (TE).** Each thematic block will begin with one or more face-to-face theory classes where the teacher will explain the key concepts, encourage interaction and discussion of doubts, and give guidelines for monitoring and preparation of complementary activities..

The support teaching material will contain the essential contents of the theoretical classes, will be available in advance on the Virtual Campus of the subject, and it is recommended that students have it available during the class (computer, tablet or paper format) to facilitate its monitoring.

- **Laboratory Practices (PLAB).** Practices related to the theoretical concepts will be carried out. Work will be done to expand and consolidate previous scientific and technical knowledge, and scientific articles will be used to encourage discussion.

### Autonomous activities

- Self-study tests with feedback will be provided, using the questionnaire utilities of the Moodle classroom of the virtual campus of the subject, to facilitate the review of the subject synchronized with the teaching of the syllabus.
- Group work. There will be several teams works in which students will try to apply their knowledge to a real situation under the supervision of the teacher. Problems will be solved by consulting different sources and using statistical software. The student's capacity for analysis, reasoning and expertise in solving problems related to the professional field will be promoted.
- Personal study. Although the subject is eminently focused on the practical implementation of knowledge in advanced modelling, there will be a minimum individual effort in order to assimilate the theoretical classes.

#### Tutorials and personal attention to students

Students are expected to attend classes and consult doubts by actively participating in their discussion. However, students can consult with the professors using the foro of the virtual campus and the e-mails indicated in the teaching staff.

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
Exam 1	15%	6	0.24	CM09, CM10, KM12, SM12, SM14
Exam 2	15%	6	0.24	CM09, CM10, KM12, SM12, SM14
On-site continuous assessment during classes	15%	4	0.16	CM09, CM10, KM12, SM12, SM14
Practical works	45%	30	1.2	CM09, CM10, KM12, SM12, SM14
Self-learning tests	10%	4	0.16	CM09, CM10, KM12, SM12, SM14

If the criteria for averaging are met, then the final mark for the course will be calculated using the weightings described in this section. Otherwise, it will be necessary to recover the affected activities in order to make up the average. A minimum mark of 5 out of 10 points is required to pass the course.

To assess the degree of achievement of the competences, the following instruments and weightings will be used:

#### Exams

There will be two partial exams with a weighting of 15% each, in which students will have to answer questions on theoretical and applied concepts. The minimum mark for weighting is 3 out of 10.

These activities are compulsory. In order to have access to the recovery it is necessary to have done 80% of the evaluable activities and to have taken the 2 mid-term exams.

#### Practical work

These activities are compulsory and it is necessary to have at least a mark of 4 out of 10 in each of them, otherwise it will be necessary to recover the affected activities. Practical work is worth 45% of the overall mark for the course.

Deliveries after the deadline:

- The late delivery of the practices will imply a penalty of 20% of the obtained mark.

These activities are compulsory and recoverable.

### Self-study activities

They will have a weight of 10% provided that at least 80% of the activities have been carried out, otherwise the mark for this part will be a zero. There is no minimum grade for these activities.

Deliveries after the deadline:

- The delivery of these activities late and up to 48 hours after the deadline, will imply a penalty of 20% on the grade obtained.
- The late delivery of activities after this 48-hour margin will mean that they will be counted as not having been completed for the evaluation.

These activities are not mandatory, but they are not recoverable either.

### Continuous training and evaluation

It is reminded that the evaluation will be made according to the contents commented by the teacher in class, and that, therefore, attendance in person is highly recommended since not all the information will be accessible on the virtual campus.

In addition, during the course there will be a continuous assessment and it will be necessary to have participated in 80% of the assessment activities for them to be weighted at 15%, otherwise the mark for this part will be a zero. Standard teaching innovation tools will be used to control class participation. There is no minimum mark for these activities.

These activities are not mandatory, but they are not recoverable either.

Summary of criteria and weights for the evaluation of the subject

	Participation <sup>1</sup>	minimum Participation <sup>2</sup>	minimum Mark <sup>3</sup>	Exercise recoverable <sup>4</sup>	Weights <sup>5</sup>
Test 1 <sup>st</sup> partial	Compulsory	100%	3	Compulsory	15%
Test 2 <sup>nd</sup> partial	Compulsory	100%	3	Compulsory	15%
Practical work	Compulsory	100%	4	Compulsory	45%
Self- study	Volunteer	≥80%	NA	Unrecoverable	10%
	Volunteer	≥80%	NA	Unrecoverable	15%

NA: Not applicable

1: Compulsory participation implies that non-participation will have to be recovered in order to be weighted, and if it is not done, it will not be possible to average, and therefore the subject will not be approved either. Voluntary participation implies that it is not compulsory but that it cannot be recovered later

2: Value of minimum participation to weight, otherwise the activities will count as 0

3: Minimum mark of 10 points to be weighted with the rest, if the minimum is not reached, the specific activity will have to be recovered, regardless of the rest of the marks of the same type

4: When the activity is recoverable, it must be recovered if the minimum mark is not obtained. In case of non-recoverable activity, the mark cannot be recovered, and therefore it will be weighted to the final mark, even if it is 0 or less than any threshold

5: Weight value if the previous criteria are met

## Bibliography

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T Hastie, R Tibshirani, J Friedman. (2009) The Elements of Statistical Learning. Data Mining, Inference and Prediction, Springer, New York.

Therneau T, Grambsch P. Modeling Survival Data: Extending the Cox Model (Statistics for Biology and Health). Springer-Verlag New York Inc.; Edición: 1st ed. 2000.

Venables, W. & Ripley, B. (2002). Modern Applied Statistics with S-PLUS. Springer

Verbeke G, Molenberghs G. Linear Mixed Models for longitudinal Data. New York: Springer-Verlag, 2000.

## Software

SAS version 9.4 software (© SAS Institute Inc., Cary, NC, USA)

STATA (© Stata Corporation, College Station, TX, USA) and

R (© 2010 R free software foundation: <http://www.r-project.org>).

## Language list

Name	Group	Language	Semester	Turn
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(PLAB) Practical laboratories	1	Catalan	second semester	afternoon
(TE) Theory	1	Catalan	second semester	afternoon

PROVISIONAL