UAB
Universitat Autònoma de Barcelona

Linear Models 2

Code: 104861
ECTS Credits: 6

2025/2026

Degree	Type	Year
Applied Statistics	OB	3

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

Knowledge of descriptive statiscics and visualization methods, probability and statistical inference. A previous course in linear models is required.

Objectives and Contextualisation

This course aims to extend the use of linear combinations of a set of predictors to reduce the uncertainty of a response variable. In particular, we will work on the use of parametric models, beyond the normal law, for the response variable. Within this more general modelling framework, we will look more closely at how information can be incorporated, for example, information about the design of the experiment using mixed models that take into accopunt random factors and covariance structures.

Learning Outcomes

1. CM09 (Competence) Assess the suitability of the models with the correct use and interpretation of indicators and graphs.
2. CM10 (Competence) Modify the existing software if required by the statistic model, or create new software, if necessary.
3. KM13 (Knowledge) Detect interactions, co-linearity and importance between explanatory variables.
4. SM11 (Skill) Analyse the residuals of a statistical model.
5. SM12 (Skill) Interpret the results obtained to formulate conclusions about the experimental hypotheses.
6. SM13 (Skill) Compare the degree of adjustment between diverse statistical models.

7. SM14 (Skill) Use graphs to visualise the fit and suitability of the model.

Content

0. Review of Linear Models

1. Generalized Linear Models:

- Link function, exponential family, canonical function
- Binary responses: Logistic regression
- Count responses: Poisson regression
- Regression for positive continuous responses: Gamma regression

2. Mixed Models with Random Factors

- Correlated data and random effects
- One random factor
- Multiple random factors
- Random slopes

3. Mixed Models for Covariance Structures

- Covariance structures
- General modeling

4. Generalized Linear Mixed Models

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Computer Practices	50	2	
Theory	50	2	
Type: Supervised			
problems / exercises to solve	16	0.64	
Type: Autonomous			
Preparation for the exam	10	0.4	

The course material (theory notes, lists of problems and statements of practice) will be available at the virtual campus, progressively throughout the course.

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
Final test	50	4	0.16	CM09, KM13, SM11, SM12, SM13, SM14
Partial exam	25	4	0.16	CM09, KM13, SM11, SM12, SM13, SM14
Practices (deliveries or check)	25	16	0.64	CM10, KM13, SM11, SM12, SM13, SM14

Continuous Assessment:

Practices: 25%
Midterm Exam: 25%
Final Exam: 50% (Minimum grade: 4)

Reassessment:

Reassessment Exam: 100%

Single Assessment:

Students who have opted for the single assessment modality must take a final test consisting of an exam that may include theoretical questions, problem-solving, and practical exercises.
This test will take place on the same day, time, and location as the Final Exam. Students who do not attend this test without a justified reason will receive a grade of NOT ASSESSED.

If the grade obtained is below 5, the student may retake the exam on the same day, time, and location as the Reassessment Exam.

Bibliography

Linear Mixed-Effects Models Using R A Step-by-Step Approach / by Andrzej Gałecki, Tomasz Burzykowski https://bibcercador.uab.cat/permalink/34CSUC_UAB/1eqfv2p/alma991010402935906709

Lee, Y., Nelder, J. and Pawitan, Y. (2006). Generalized Linear Models with Random Effects. Chapman & Hall. London.

John E. Freund, Irwin Miller, Marylees Miller. (2000) Estadística matemática con aplicaciones. Pearson Educación. (existeix castellà)

McCullagh, P. and Nelder, J. (1992). Generalized Linear Models. Chapman & Hall. London.

Daniel Peña; *Regresión y diseño de Experimentos*, Alianza Editorial (Manuales de Ciencias Sociales), 2002.

Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani; An Introduction to Statistical Learning, Springer texts in Statistics, 2013.

Christopher Hay-Jahans; *An R Companion to Linear Statistical Models*. Chapman and Hall, 2012.

John Fox and Sandord Weisberg; *An R Companion to Applied Regression*, 2nd edition, Sage Publications, 2011.

Software

R Core Team. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.

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
(PLAB) Practical laboratories	1	Catalan	first semester	afternoon
(TE) Theory	1	Catalan	first semester	afternoon