VNIVERSITAT Ö ID VALÈNCIA

COURSE DATA

Data Subject

Code	34177
Name	Statistical modelling
Cycle	Grade
ECTS Credits	6.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
1107 - Degree in Mathematics	Faculty of Mathematics	4	Second term

Subject-matter

Degree	Subject-matter	Character
1107 - Degree in Mathematics	17 - Models of statistics and operations research	Optional

Coordination

Name	Department
AYALA GALLEGO, GUILLERMO	130 - Statistics and Operational Research

SUMMARY

This course aims to give an overview of how to perform a complete statistical analysis, specifically how to perform previously the most essential part correctly modeling the situation to be studied and the selection of the best model that fits the data analyzed.

To do so, the basics of modeling and the most important techniques available to perform the appropriate statistical analysis are introduced. The course describes with more detail those concepts of statistical inference previously introduced on the first year course on "Basic Statistics". It will also make use of the basic concepts and techniques of estimation (point and confidence intervals) and contrast hypothesis presented in the course of "Mathematical Statistics" (third year of the degree).

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

Have studied the subjects of Basic Statistics (1st year of the degree), Probability (2nd year) and Statistics Mathematics (3rd year).

OUTCOMES

1107 - Degree in Mathematics

- Learn autonomously.

- Adapting to new situations.

- Apply the knowledge in the professional world.

- Argue logically in decision-making.

- Expressing mathematically in a rigorous and clear manner.

- Reason logically and identify errors in the procedures.

- Capacity of abstraction and modeling.

- Participate in the implementation of software and learn mathematical software.

- Knowing the time and the historical context in which occurred the great contributions of women and men in the development of mathematics.

- Visualize and interpret the solutions obtained.

LEARNING OUTCOMES

- Formulate and solve problems of various types using statistical models.
- Learn to assess the conditions of application of statistical models.
- Use statistical analysis sotware.
- Correctly interpret the results provided by statistical packages.

DESCRIPTION OF CONTENTS

1. Introduction to Statistical Modeling

1.1 Basics.

1.2 Response and explanatory variables. Factors. Types of effects.

1.3 Explanatory variables: continous.

1.4 Linearity.

1.5 Basic models.

1.6 Introduction to R.

2. Regression models

2.1 Simple linear regression model.

2.2 Multiple linear regression model.

2.3 Model validation.

2.4 Variable selection.

2.5 Predicting.

3. Experimental Design

3.1 One way ANOVA.

3.2 Two way ANOVA.

3.3 Multiple comparisons.

3.4 Analysis of covariance.

4. An introduction to categorical data analysis

4.1 Estimating and companing proportions.

4.2 Contingency tables.

4.3 Independency and homogeneity test.

4.4 Fisher´s test.

5. Generalized lineal model

5.1 General linear model as a generalized linear model.

5.2 Generalized lineal model.

5.3 Bernoulli, Poisson and Negative binomial responses.

5.4 Model validation.

5.5 Variable selection.

6. Other models

6.1 Local regression.
6.2 Nonlinear models.
6.3 Spatio-temporal models.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	37,50	100
Computer classroom practice	15,00	100
Other activities	7,50	100
Attendance at events and external activities	2,00	0
Development of group work	10,00	0
Development of individual work	10,00	0
Study and independent work	20,00	0
Preparation of evaluation activities	20,00	0
Preparing lectures	10,00	0
Preparation of practical classes and problem	10,00	0
Resolution of case studies	8,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

The teacher will introduce and develop the content of each topic in the lectures. In the practical classes, concepts presented in the lectures will be apply using statistical software. Students will be proposed to solve homeworks requiring the use of the techniques learned in lectures.

EVALUATION

The evaluation of the learning of the knowledge and competences achieved by the students will be done continuously throughout the course, and will consist of the following evaluations method:

a) **Evaluation of participation in the practical sessions**. This evaluation willl represent 4**0 %** of the grade and will be based on the completion of questionnaires. These questionnaires will be made during the course and on the same day of the theoretical exam the last of them will take place. All of them will be used for thhe evaluation of the practices.

b) **Evaluation of the knowledge acquired**. It will consist of a theoretical examination with questions, where the resolution of the same may require the interpretation of different results presented in the standard form of the statistical woftware used during the course. This evaluation will represent 60% of the final grade. To pass the subject, it will be necessary to obtain a grade equal to or greater than 5 points (out of 10) of this exam.

The grades obtained in **(a)** will be kept in the two calls of the academic year in which they were made. Its qualification is not recoverable, since its evaluation is only possible in the teaching period.

REFERENCES

Basic

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Referència b1:   Faraway, J. J.Linear Models with R, Second Edition (Chapman & Hall/CRC Texts in Statistical Science) Chapman and Hall/CRC, 2016
Referència b2:   Faraway, J. J. Extending the Linear Model with R . Taylor & Francis, 2016
Referència b3:   Agresti,A. Categorical Data Analysis Wiley-Interscience, 2013

Additional

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Referència c1:   Agresti, A. Foundations of Linear and Generalized Linear Models John Wiley & Sons Inc, 2015
Referència c2:   Sheather, S. J. A Modern Approach to Regression with R . Springer,
Referència c3:   Christian Ritz, J. C. S. Nonlinear Regression with R . SPRINGER VERLAG GMBH, 2008