2020/2021

Biostatistics

Code: 100811
ECTS Credits: 6

Degree	Type	Year	Semester
2500251 Environmental Biology	FB	1	1

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

Contact

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Use of Languages

Principal working language: catalan (cat)

Some groups entirely in English: No

Some groups entirely in Catalan: Yes

Some groups entirely in Spanish: No

Teachers

Jaume Aguadé Bover

Javier Retana Alumbreros

Miquel Riba Rovira

Prerequisites

No specific prerequisites are required for this subject.

Objectives and Contextualisation

This subject is an introduction to statistics. Its objective is to transmit its usefulness in the analysis of data and the design of experiments and, to show which are the most appropriate tools according to the objectives of the study and the available data.

Competences

- Apply ICT resources pertaining to this field of study.
- Apply knowledge of theory to practice.
- Design models of biological processes.
- Display basic knowledge of mathematics, physics and chemistry.
- Obtain information, design experiments and interpret results.
- Reason critically.
- Solve problems.

Learning Outcomes

1. Apply ICT resources pertaining to this field of study.
2. Apply frequency distributions to determine levels of statistical significance.

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3. Apply knowledge of theory to practice.
4. Apply the concept of null hypothesis.
5. Distinguish between continuous, discrete and categorical variables.
6. Distinguish between dependent and independent variables of an explanatory mathematical model.
7. Formulate conceptual models mathematically.
8. Identify and distinguish between the statistical analyses needed to test hypotheses.
9. Interpret the results of the statistical analyses and apply them to the hypothesis testing.
10. Obtain information, design experiments and interpret results.
11. Reason critically.
12. Solve problems.
13. Synthesise quantitative data series in the form of tables and graphs.
14. Understand and apply the concept of statistical probability .
15. Understand and apply the concepts of mean and variability.

Content

1. DESCRIPTIVE STATISTICS: Exploration of data

1.1 Variables versus individuals. Qualitative and quantitative variables

1.2 Graphical representation

1.3 Summary statistics

1.4 Scatter plots and correlation

1.5 Contingency tables

1.6 Introduction to the linear regression model

2. INTRODUCTION TO PROBABILITY: Random variables and distributions

2.1 Concept of probability

2.2 Properties of probability

2.3 Random variables

2.4 Some useful distributions: Binomial, Poisson and Normal

2.5 Notions about the Central Limit Theorem

3. STATISTICAL INFERENCE FOR VARIABLES

3.1 Introduction to statistical inference

3.2 Notions of experimental design, type of studies and sampling

3.3 Parameter estimation and confidence intervals

3.4 Contrast of hypothesis: concept and reasoning. Significance level (p-value)

3.5 Inference for the population mean. paired data

3.6 Inference for two means comparisons

3.7 Inference for proportions

3.8 Inference for the mean in more than two populations (ANOVA)

3.9 Nonparametric tests

4. STATISTICAL INFERENCE FOR ASSOCIATIONS BETWEEN VARIABLES

4.1 Contingency table. Chi-square test

4.2 Inference by the correlation coefficient

4.3 Simple linear regression model

5. NOTIONS ON STATISTICAL MODELING

5.1 Concept of response variables and predictor variables

5.2 Models for quantitative response variables

5.3 Models for qualitative response variables

Methodology

To reach the contents of this subject it will be necessary to follow both the directed activities (master classes, problems and practices with computers) and the work of individual study outside the classroom.

The proposed teaching methodology may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Master class	29	1.16	15, 14, 5, 6, 7, 8, 9, 11
Practices with computer	15	0.6	4, 3, 2, 1, 15, 14, 5, 6, 8, 9, 10, 11, 13
Resolution of exercices	10	0.4	4, 3, 2, 15, 14, 5, 6, 8, 11, 12, 13
Type: Supervised			
Fulfillment of assignments	16	0.64	4, 3, 2, 1, 15, 14, 5, 6, 8, 9, 11, 12, 13
Tutorship	4	0.16	3, 9, 11
Type: Autonomous			
Study	71	2.84	4, 3, 1, 6, 8, 9, 12

Assessment

The evaluation of this subject will be done with the practical sessions and the realization of problems. Apart there will also be two global tests.

The qualification of practices will be done through two tests where several exercises will be performed using

the software learned in these sessions.

The first evaluation does not release matter. The final evaluation will therefore include all the theory taught during the course. To pass the subject it is necessary that the weighted average of the marks (exams, practices and problems) is at least 5 and that the final exam grade is higher than 4. Students who do not pass the final exam can submit to the final exam. a recovery exam. To participate in the recovery of students must have been previously evaluated in a set of activities the weight of which equals a minimum of two thirds of the total grade of the subject

The grade of "Not evaluable" will be applied to the students when the evaluation activities carried out have a weight lower than 67% in the final grade.

Student's assessment may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Final exam	40%	2	0.08	4, 3, 2, 15, 14, 5, 6, 7, 8, 9, 11, 12, 13
First exam	20%	2	0.08	3, 2, 15, 14, 5, 7, 11, 12, 13
Fulfillment of assignments	10%	0	0	4, 3, 8, 9, 12
Practical exam	30%	1	0.04	3, 1, 9, 10, 11

Bibliography

- Moore, D.S, Notz W.I. & Fligner M.A. (2011). **The Basic practice of statistics**. 6thed. Freeman.
- Gotelli, N.G. & Ellison, A.M. (2013). **A Primer of ecological statistics**. 2nd ed. Sinauer Associates.
- Moore, D.S. (2005). **Estadística aplicada básica**. 2a ed. Antoni Bosch editor.
- Moore, D.S., McCabe, G.P. & Craig, B.A. (2015). **Introduction to the practice of statistics**. 8th ed. Freeman.
- Zaiats, V., Calle, M.L. & Presas, R. (2001). **Probabilitat i estadística: exercicis I**. 2a ed.Col·lecció: Materials, 107. Universitat Autònoma de Barcelona.