Universitat Autònoma de Barcelona

2019/2020

Biostatistics

Code: 100766
ECTS Credits: 6

Degree	Type	Year	Semester
2500250 Biology	FB	1	1

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

Prerequisites

Although there are no official prerequisites, it is advisable for the student to review: 1) Combinatorics and Newton's binomial. 2) The probability and the statistics that have studied in the Baccalaureate. 3) The elementary functions (exponential, logarithm), summations.

Objectives and Contextualisation

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Contextualization:

This is a basic, instrumental type course that introduces probabilistic tools and basic statistics in Biology studies in order to analyze biological data from the description of natural phenomena or experiments. These tools will be used for other subjects of the degree and are essential for the future graduate in Biology training both for the pursuit of their profession and for research.
Along with Mathematics, this is characterized by the fact that in addition to its own content, it helps the students to develop scientific rigor and logical thinking.

Training objectives of the subject: it is intended that the student
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- Be able to use fluently the language of the probability and the statistics used in Biology.
-Learn how to explore descriptive methods with various sets of data, resulting from the observation of biological phenomena or experimentation.
-Be able to raise the most suitable probabilistic models in different situations, and know how to use the probability
rules to calculate the probability of the events of interest.

-Know and understand the concept of random variable, know classical examples of random variables and in what situations are used for modeling.
- Learn how to use the methods of statistical inference (confidence intervals and hypothesis tests) to reach conclusions on one or more populations
based on partial information contained in random samples.
-Know computer tools (R software and DeduceR user graphical interface) for the statistical treatment of data.
-Apply common sense and develop a critical spirit in dealing with the problems that will have to be solved, both at the time of its resolution and resolution,
as well as at the time of drawing conclusions and making decisions.

Competences

- Apply statistical and computer resources to the interpretation of data.
- Be able to analyse and synthesise
- Develop independent learning strategies.
- Obtain information, design experiments and interpret biological results.
- Understand, interpret and use mathematical and statistical tools to solve problems in biology.
- Work in teams.

Learning Outcomes

1. Apply statistical and computer resources to the interpretation of data.
2. Be able to analyse and synthesise.
3. Design experiments based on knowledge of statistics.
4. Develop independent learning strategies.
5. Identify and interpret the statistical tools that can be used to solve problems in biology.
6. Obtain information from experimental data, present it correctly and interpret it.
7. Use statistical tools to solve problems in biology.
8. Work in teams.

Content

Content

1. Descriptive statistics. (Part of the topics of this chapter will
be developed in practice classes with statisticas software)

Data and random error. Measurement scales. Descriptive analysis
ofdata from a single variable: frequency distributions, graphic
representations, numerical summaries (position, dispersion and shape
measurements). Descriptive analysis of data from two variables:
correlation and regression line, tables of contingency.

2. Probability.
Basic properties of probability. Conditional probability. Formula of total probabilities. Bayes Formula. Independence of eventsDiscrete random variables: Bernoulli, Binomial and Hypergeometric.Expectation and variance of a random variable.
Continuous random variables: Normal distribution. Approximation of the Binomial by the Normal distribution. Independence of random variables.

3. Statistical inference.

Introduction to Statistics: population and sample, parameters and estimators.
Distribution of the mean sample in the normal case with known variance: Z-statistic.

Confidence interval of for the mean of a normal populatipn with known variance.
Student's distribution. The case of the unknown variance: the T-statistic and the confidence interval for the mean of a normal population with unknown variance.
The sample proportion of a poblational characteristic. Asymptotic confidence interval for the proportion.

Introduction to hypothesis tests. Hypothesis test for the mean of the normal with known variance and with unknown variance.
Tests for the poblation proportion. Tests to compare two normal populations. The test of comparison of variances. The case of two dichotomous populations. The Shapiro-Wilk test of normality. Non-parametric tests for the comparison of means.
The chi square tests of goodness of adjustment of independence.
Hypothesis tests to compare more than two normalpopulations: introduction to the Analysis of Variance (ANOVA).

Methodology

The center of the learning process is the work of the student. The student learns working, being the mission of the teaching staff help him/her in this task by providing information or showing him/her the sources where one can get it and directing your steps in a way that the learning process can be carried out effectively. On line With these ideas, and in accordance with the objectives of the subject, the course development is based on the following activities:

Theory classes:

The student acquires the scientific-technical knowledge of the Subject assisting the theory classes, complementing them with Self-study of the subjects explained in order to assimilate the concepts and the procedures, to detect doubts and to realize summaries and schematics of the subject. In the theory classes the teacher introduces the basic concepts corresponding to the subject of the subject, showing their own application They are made with slate and with the support of ICT.

Problems and practices:

The problems and the practices are sessions with a smaller number of students where the scientific-technical knowledge is worked Exposed in theory classes to complete their understanding and deepen it by solving problems and cases Practical, with the appropriate software. The students will work on individually or in group, under the supervision of the teacher, solving the proposed problems. This will be done both in class and at autonomous way by the student.

There will be 12 sessions of one hour (for each group) of problems and 4 Practical sessions with a computer, to which the student will learn to use the free R software with the graphical user interface DeduceR I in order to apply the statistical tools for the analysis descriptive of sets of data.

Activities

Title	Hours	ECTS	Learning Outcomes

Type: Directed			
Classes of theory	16	0.64	1, 4, 3, 5, 6, 2, 8, 7
Classes of theory, problems and practice	32	1.28	3, 5, 6, 2, 7
Type: Supervised			
Individual Tutorials	10.5	0.42	1, 4, 3, 5, 6, 2, 7
Type: Autonomous			
Study + work of problems and practices	83.5	3.34	1, 4, 3, 5, 6, 2, 8, 7

Assessment

The evaluation of the subject consists of a part of continuous

evaluation of the acquired competences: there will be a partial

eliminatory examination

with a weight of 30%, there will also be a second eliminatory partial, with a weight of 45%. These two partials wil

The evaluation of the practices with computer, will have a weight of 25% in

the final evaluation of the subject. The note of the practice part

will be obtained from exam of exercies solved useing statistical

software. To participate in the recovery examination, the students

must have been previously evaluated in a series of activities whose

weight equals to a minimum

of 2/3 of the total grade of the subject. Therefore, the students will obtain the "Non-evaluable" qualification when

out have a weighting of less than 67% in the final grade.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Partial exams	75%	5	0.2	1, 4, 3, 5, 6, 2, 7
Practice exam	25%	1.75	0.07	1, 4, 3, 5, 6, 2, 7
Recovery exam	75%	1.25	0.05	1, 4, 3, 5, 6, 2, 8, 7

Bibliography

Bibliografy

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Bardina, X., Farré, M.: *Estadística descriptiva*. Manuals UAB, 2009