

Biostatistics

Code: 100910
ECTS Credits: 3

Degree	Type	Year	Semester
2500252 Biochemistry	OB	2	1

Contact

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Teaching groups languages

You can check it through this [link](#). To consult the language you will need to enter the CODE of the subject. Please note that this information is provisional until 30 November 2023.

Prerequisites

Although there are no official prerequisites, it is advisable for the student to review:

- 1) Elementary combinatorics and binomial theorem.
- 2) Statistics and probability theory that have been studied in High School.

The elementary functions (including exponential, logarithm), the use of summations in mathematical notation, elementary derivation and integration.

Objectives and Contextualisation

(Google translate from catalan version)

This is a subject of the second year, basic education, which develops the foundations of modern scientific thinking.

It is the basis to understand the acquisition of knowledge through experimentation.

Training objectives of the subject: it is intended that the student:

- Be able to use fluently the language of the probability and the statistics that are used in the biosciences.
- Learn to explore different descriptive methods of data sets, resulting from the realization of experiments.
- Be able to raise the most suitable probabilistic model in different situations, and know how to use the probability properties to calculate the probability of the events that interest you.

- Know and understand the concept of random variable, and know the classical examples of random variable and in what situations are used for modeling.
- Learn to use the methods of Statistical Inference (hypothesis tests) to be able to reach conclusions about a population from the partial information contained in a sample.
- Know computer tools (suitable software) for the statistical treatment of data.
- Apply common sense and develop a critical spirit when it comes to dealing with the problems that will have to be solved, both at the time of its resolution and resolution, as well as when drawing conclusions and making decisions.

Competences

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Interpret experimental results and identify consistent and inconsistent elements.
- Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
- Understand the language and proposals of other specialists.
- Use ICT for communication, information searching, data processing and calculations.
- Use the basics of mathematics, physics and chemistry that are required to understand, develop and evaluate the chemical procedures of living matter.

Learning Outcomes

1. Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
2. Analyse the relationship between variables using regression techniques.
3. Describe the basic properties of point estimators and interval estimators
4. Formulate and solve hypothesis contrast problems in one or two populations
5. Interpret experimental results and identify consistent and inconsistent elements.
6. Select the appropriate statistical decision test for each data set or situation and interpret the results in order to reach conclusions
7. Select the appropriate statistical test for the data set
8. Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
9. Understand statistical language and the probabilistic significance of the conclusions obtained
10. Understand the language and proposals of other specialists.
11. Use ICT for communication, information searching, data processing and calculations.
12. Use a spreadsheet and statistical software to represent or adjust data and perform statistical tests

Content

1.- Descriptive statistics

2.- Probability:

Definition and properties. Conditional probability. Independence of events.

Random variables (discrete and continuous with emphasis on Binomial and Normal models).

Independence of random variables. Central Limit Theorem.

3.-Inference - test of hypothesis:

Statistics that measure position and dispersion. Sample distributions. Confidence intervals.

Introduction to hypothesis tests. Tests for the mean and for the variance of Normal populations. Tests for proportions.

Mean comparison tests for two normal populations. Comparison test for two proportions.

Khi-square independence test.

4.- Introduction to the Analysis of Variance (ANOVA):

Comparison of means of 3 or more populations.

Methodology

In the learning process, the work of the student is fundamental. The student will have the help of the teacher at all times. Apart from the face-to-face hours corresponding to the activities led by the teacher, the student must devote some time to tutorials, which are supervised activities, and some time to independent work.

The face-to-face hours of Directed Activities are distributed in:

Theory: these are lectures in which the teacher introduces the basic concepts corresponding to the subject, while showing examples of their application. The student must complement the teacher's explanations with independent personal study in order to assimilate the concepts, procedures and proofs, in order to detect doubts and to create summaries and outlines of the subject.

Problems: Problem sessions are done in smaller groups. In them, the understanding of the concepts introduced in the theory classes is worked on with the resolution of exercises. Students will work individually or in groups, under the supervision of the teacher, solving the proposed exercises or assignments. They will do this both in problem class and independently.

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.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Exercise resolution classes	4	0.16	2, 3, 6, 5, 12, 7, 9
Theory classes	20	0.8	1, 8, 2, 11, 3, 4, 10, 6, 5, 12, 7, 9
Type: Supervised			
Tutorials	2	0.08	11, 3, 6, 5, 12, 7, 9
Type: Autonomous			
Individual study	26	1.04	2, 11, 3, 4, 6, 5, 12, 7, 9

Assessment

The evaluation of the subject consists of a part of continuous evaluation of the acquired competences that will be carried out during the academic period, with an intermediate test, delivery of written solutions to proposed exercises or the realization of practical works.

This part will have a weight of 50% in the final evaluation of the subject. The remaining 50% of the evaluation of the subject is obtained by taking a final written exam. This 50% can be reassessed on the date decided by the Faculty. The part corresponding to the continuous assessment cannot be recovered.

To participate in the reevaluation, the students must have been previously evaluated in a series of activities whose weight is at least two thirds of the total grade of the subject or module. Therefore, students will obtain the "Not-evaluable" qualification when the evaluation activities carried out have a weighting of less than 67% in the final grade.

Those who have opted for the single assessment will take a single test divided into two parts.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Exam	50%	3	0.12	1, 8, 2, 3, 4, 6, 5, 12, 7
Exercises	20%	4	0.16	1, 8, 2, 11, 3, 4, 10, 6, 5, 12, 7, 9
Mid-term exam	30%	2	0.08	1, 8, 3, 4, 6, 12, 7

Bibliography

1. P.R. Bergethon, The physical basis of biochemistry, chapter 5: Probability and Statistics. Springer Science+Business Media, LLC 2010 (ebook)
2. R. Delgado: Probabilidad y Estadística para ciencias e ingenierías, Editorial Delta, 2008.
3. B.C. Gupta, I. Guttman, and K.P. Jayalath. Statistics and Probability with applications for engineers and scientists using minitab, R, and JMP, John Wiley and sons, Inc. Edition 2020. (ebook)
4. J.I.E.Hoffman, Basic biostatistics for medical and biomedical practitioners, Elsevier (ebook)
5. Susan Milton, Estadística para biología y ciencias de la salud, McGraw-Hill/Interamericana de España, 2007, 3a ed. ampl.

Software

R, MS Excel