

Biostatistics

Code: 100910
ECTS Credits: 3

Degree	Type	Year	Semester
2500252 Biochemistry	OB	2	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) 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. Samples 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

(Google translate from Catalan version)

The work of the student is fundamental in the process of learning the subject, who will always have the help of the teacher. Apart from the contact hours corresponding to the activities directed by the teacher, the student will have to dedicate a time to the tutorials, which are supervised activities, and a time to the autonomous work.

The face-to-face hours of guided activities are distributed in:

Theory: these are master classes in which the teacher introduces the basic concepts corresponding to the subject matter, showing examples of its application. These classes are remote. Videos or other materials are available to students on the virtual campus. The student will have to complement the explanations of the professor with the autonomous personal study in order to assimilate the concepts, the procedures and the demonstrations, in order to detect doubts and to realize summaries and schemes of the subject.

Group tutorials: these are face-to-face classes in small groups. In these the theory classes are completed. The most important or most complex topics of the theory and those in which the student has encountered the most difficulties will be addressed.

Problems: Problem classes are done in smaller groups and are face-to-face. They work on understanding the concepts introduced in theory with the realization of problems. Students will work individually or in groups, under the supervision of the teacher, solving the exercises or tasks proposed. They will do this both in the problem class and autonomously.

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

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
Group tutorials	4	0.16	2, 3, 4, 6, 5, 12, 7, 9
Theory classes	12	0.48	3, 4, 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
Practical works	18	0.72	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. The final exam (50%) can be retaken on the date decided by the Faculty. The part corresponding to the continuous evaluation can not be reevaluated.

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.

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

MS Excel