COURSE DATA

DATA SUBJECT

Code: 36837
Name: Biostatistics
Cycle: Undergraduate Studies
ECTS Credits: 4.5
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
1106 - Degree in Biology	Facultat de Ciències Biològiques	2	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1106 - Degree in Biology	Bioestadística	COMPULSORY

COORDINATION

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SUMMARY

Biostatistics is a basic subject for the training of any experimental scientist. Its objective is to provide students with the tools and fundamental concepts of Statistical Methods necessary to formulate hypothesis testing, recognize simple probabilistic models, analyze data that has been obtained directly in nature or as a result of laboratory experiments, and make decisions based on the conclusions obtained from this analysis.

The course Biostatistics is part of the second year of the Biology Degree, it is located in the second quarter of the year, when the Mathematics course has already been taken, which lays the foundations of the concepts of probability density function and probability distribution, based on the concepts of integration and differentiation.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

It is a requirement to know the basic concepts of Probability corresponding to Mathematics I of the first year of High School.
It is recommended that the student is able to interpret statements of practical assumptions and pose them using mathematical language.

COMPETENCES / LEARNING OUTCOMES

1106 - Degree in Biology

Interpret, analyse, evaluate, process and synthesise biological data and information by applying mathematical and statistical methods.

Organise, plan and manage information in a manner that allows the individual to analyse, synthesise and develop critical reasoning that can be applied to solve problems, make decisions and carry out work.

Students must have acquired knowledge and understanding in a specific field of study, on the basis of general secondary education and at a level that includes mainly knowledge drawn from advanced textbooks, but also some cutting-edge knowledge in their field of study.

Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration.

Use ICTs, apps and other computer tools to manage and disseminate information in both educational and professional environments.

Use scientific language, both oral and written, and be able to adapt the register to the target audience and/or readers. Use the most common foreign languages in each discipline as a vehicle for communication in a globalised system.

DESCRIPTION OF CONTENTS

1. Exploratory data analysis

1.1. Populations and samples.
1.2. Types of variables and relationships among them.
1.3. Graphical description of variables and analysis of their relationship.
1.4. Numerical description of samples.

2. Inference in a population

2.1. Population parameters.
2.2. Estimation of the population mean.
2.3. Hypothesis contrasts on the mean.

3. Analysis of two samples

3.1. Related samples.
3.1.1. Design of experiments with related observations.
3.1.2. T-test and confidence interval.
3.1.3. Sign test.
3.2. Independent samples.
3.2.1. Design of experiments with independent observations.
3.2.2. T-test and confidence interval.
3.2.3. Mann-Whitney test.

4. Analysis of two or more independent samples

4.1. Design of experiments with k independent samples.
4.2. Analysis of variance and a posteriori comparisons.
4.3. Kruskal-Wallis test.

5. Analysis of categorical data

5.1. Analysis of proportions.
5.2. Goodness-of-fit analysis.
5.3. Contingency table analysis.

6. Linear regression

6.1. Parametric interpretation of regression: the linear model.
6.2. Statistical inference on the slope.
6.3. Correlation coefficient.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	3,00
Theory	26,00
Computer classroom practice	16,00
Total hours	**45,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00

Individual or group project	8,00
Independent study and work	18,50
Preparation of lessons	41,00
Preparation for assessment activities	0,00
Resolution of case studies	0,00
Total hours	**67,50**

TEACHING METHODOLOGY

In the theory classes, real problems will be studied that require the methodology corresponding to each topic. Then, the appropriate statistical technique will be introduced and applied to solving the problems using statistical software. For the preparation of the course, the student will have a collection of problems, separated by topics, which he/she will have to solve on his/her own.

The practical classes, in computer classroom and synchronized with the theory, will allow the student to apply these procedures to solve problems, some of which he/she will have to give to the teacher for their evaluation. Each student will have a dossier in which the content of each practical class is described and includes the problems to be solved.

The tutoring sessions, in small groups, are based on complementary material that will be provided to the students in advance and serve to remember, discuss, and focus on the concepts that the students should already know and understand at that moment.

All documents will be available in the Virtual Classroom environment in PDF (portable document format).

The teaching process will be organized using teaching methods and methodologies that promote student activity and allow an average student to achieve and incorporate the competencies set in the time allotted for the course. The methodologies we will use in the course will be the expository class, the practical class, and learning based on the resolution of exercises and problems, or any combination of them.

The activities of the subject are completed and complemented with the transversal activity "Interdisciplinary Seminars" directly focused on the work on competencies.

Interdisciplinary work: conducting and presenting a seminar. This is a cross-disciplinary activity common to all subjects in the second year of the degree in Biology (Histology, Developmental Biology, Biochemistry, Botany II, Genetics, Paleontology, Evolutionary Processes and Mechanisms, Zoology II, and Biostatistics). It consists of the preparation and presentation, by a working group (3 students), of a seminar, which will consist of a written text and an oral presentation. The activity is compulsory for all students enrolled in the second year, except for those who have done it before. Each working group prepares a seminar on a topic assigned by lottery from among those proposed by the lecturers of the participating subjects. Each interdisciplinary work will thus be linked to the subject on which the assigned topic directly depends. A tutor will be assigned to each of the projects, who will supervise the completion of the project and supervise its presentation. To this end, a series of regular meetings will be held with the tutor throughout the course. A co-tutor will also be assigned, who will review the final version of the work submitted. Each paper will be presented orally by all members of the group for 30 minutes. The presentation will be attended by all students on the course, as attendance is compulsory, and by two lecturers: the tutor and a second lecturer. Both students and teachers will take part in the presentation.

EVALUATION

The evaluation will be done continuously throughout the course, and will consist of the following evaluation blocks:

1. Theory and Practical classes. Since the objectives of the subject Biostatistics focus on the application of statistical techniques to biological problems, the knowledge acquired in the theory and computer sessions will be evaluated jointly. This evaluation will be carried out in two stages:

a) Continuous evaluation consisting of different tasks (up to 2 points, 20% of the final grade).

b) Final evaluation, consisting of a theoretical-practical exam whose resolution will require the interpretation of different results presented in the standard format of the statistical software used during the course (up to 7 points, 70% of the final grade). To average with the evaluation obtained in (1.a) and (2), it will be necessary to obtain in this theoretical-practical exam a grade equal or higher than 5 points (out of 10).

2. Interdisciplinary seminar. 1 point, 10% of the final grade

The grade obtained in the interdisciplinary work will account for 10% of the grade for the subject. The tutor and an assistant lecturer (cotutor) will participate in the grading and will take into account both the oral presentation of the work and the written text. In these assessments, the relative weight of the tutor's and co-tutor's marks will be 60% and 40%, respectively. The evaluation of this activity will take into account both the scientific content and the way in which it has been presented, especially the ability to communicate and transmit ideas and concepts. The works selected for presentation at the Biology Congress will receive an extra mark, corresponding to 10% of the mark for the activity.

In order to pass the course, the final grade, after adding the three previous sections, must be equal to or higher than 5 points.

The grades obtained in section 1.a will be kept in the two calls of the academic year in which they have been taken since their evaluation will only be possible during the second four-month period and never in the extraordinary call.

In the event of failing the course, the grade for the interdisciplinary work will be saved for the following year.

In the event that the interdisciplinary work (of a compulsory nature) is not carried out, this subject will be failed if it is the subject linked to this interdisciplinary work, regardless of the grade obtained in the rest of the subject.

REFERENCES

Basic references

- -Milton, J.S. (2001). Estadística para Biología y Ciencias de la Salud. Madrid: Ed. Interamericana-McGraw-Hill. 3ª Edición.
- - Quinn, Gerry P. y Keough, Michael J. (2002) Experimental Design and Data Analysis for Biologists. Cambridge University Press.
- - Samuels, M.L. & Witmer, J.A. (2003). Statistics for the Life Sciencies.(Third Ed.) San Francisco, CA: Dellen Publishing Company.

Complementary references

- -Hawkins, D. (2005) Biomeasurement, Understanding, analysing, and communicating data in the biosciences. Oxford University Press.
- - Sokal, R.R. & Rohlf, F.J. (1995). Biometry: the principles and practice of statistics in biological research. 3rd edition. W. H. Freeman and Co.: New York.