

**Probability and Statistics**

Code: 100965  
ECTS Credits: 6

Degree	Type	Year	Semester
2500253 Biotechnology	FB	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**

A good achievement of the contents of the course of Mathematics of First of Biotechnology guarantees the knowledge that requires this subject.

**Objectives and Contextualisation**

*Statistics is the technology of the scientific experimental method (Mood, 1972).*

The aim of the course is to introduce the fundamental tools of probability and statistical inference to analyze biological data from the description of natural phenomena or experiments, focusing on the proper use and interpretation of results.

**Competences**

- Make decisions.
- Reason in a critical manner
- Use the fundamental principles of mathematics, physics and chemistry to understand, develop and evaluate a biotechnological process.

**Learning Outcomes**

1. Analyse the relationship between variables using techniques for analysing variance, linear and non-linear regression, and correlation.
2. Correctly adjust experimental measurements for linear and non-linear regression.
3. Describe the basic properties of point estimators and interval estimators. Formulate and solve hypothesis contrast problems in one or two populations.
4. Explain the principles behind the theory of probability that underlie inferential statistics and recognise real situations in which the most common probabilistic distributions appear.
5. Make decisions.
6. Reason in a critical manner

**Content**

## 1. Descriptive Statistics of one and two variables

- Descriptive statistics (mean and standard deviation, range, median and quartiles, covariance and correlation coefficient).
- Graphic representations.
- Descriptive bi-variant.

## 2. Probability and random variables

- Notion of probability. Conditional probability. Independent events.
- Random Variable. Expectation and variance. Independent random variables.
- Classical discrete distributions: Bernoulli, Binomial, Poisson ...
- Classical continuous distributions: Uniform, Exponential, Normal and derived distributions.

## 3. Statistical inference in data analysis

- Population and sample. Statistics: mean, variance and sample proportion.
- inference: estimation and confidence intervals.
- Testing hypotheses.
- Comparison of two populations.
- Analysis of variance of a factor.

## 4. The simple linear regression model

- The estimate of the least squares regression line,
- Test the relationship between the variables.
- Confidence intervals for the prediction.

## Methodology

Lectures:

The concepts of the subject will be present. It will be focus on the results and interpretation of the relationship between these concepts and their applications. Examples that allow students to deal independently solving problems will be shown.

Classes of problems:

Students will have a list of problems in the course, which will work progressively.

Independent activities:

Individual study of the theory: the reflection and deepening of the subject introduced by class notes and bibliography must be addressed.

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			
Classes of problems	16	0.64	2, 1, 3, 4, 5, 6
Lectures	32	1.28	2, 1, 3, 4, 5, 6

Problem solving	64	2.56	2, 1, 3, 4, 5, 6
Study of the theory	32	1.28	2, 1, 3, 4, 5, 6

## Assessment

A continuous evaluation will be carried out by means of:

a) There will be an exam (First Partial = EP1) in the middle of the semester in which the work done until that moment will be evaluated. The mark of this exam will provide 40% of the final grade. All students who take this exam can no longer be graded as NON-EVALUABLE. A student who has not taken this exam will be listed as NON-EVALUABLE for academic purposes and will not have the right to retake it (except for a duly justified reason, in which case the retake exam will be allowed).

b) At the end of the semester there will be a second partial exam (called EP2) in which the knowledge of the subjects that have not been evaluated in the first partial will be evaluated. The mark of this exam will provide another 40% of the final grade. A student who has not taken this exam will not be entitled to retake it (except for a duly justified reason, in which case the resit exam will be allowed).

c) There will be an evaluation corresponding to the deliveries of exercises, with qualification ENT, that will be worth 20% of the final note. This part of the note will not be recoverable.

If the average  $C = (0.4) EP1 + (0.4) EP2 + (0.2) ENT$  is 5 or higher, the final grade is C. If not, the student must go to the exam recovery. Students who want to improve their mark can also take the entrance exam, but always keeping in mind that their final grade will be the mark of this exam, regardless of whether it is higher or not than C.

5% of the students will be able to obtain the qualification of Honorary Enrollment. They will necessarily have to have a grade equal to or higher than 9. The final decision on the MH grade will be made by the teacher.

For each evaluation activity, a place, date and time of review will be indicated in which the student will be able to review the activity with the teaching staff. In this context, claims may be made on the grade of the activity, which will be evaluated by the teacher responsible for the subject. If the student does not appear for this review, this activity will not be reviewed later. Dates of problem deliveries and midterm exams will be posted on the Virtual Campus (CV) and may be subject to possible scheduling changes for reasons of adaptation to possible incidents; these changes will always be reported to the CV as the CV is understood to be the usual mechanism for exchanging information between teacher and students.

Without prejudice to other disciplinary measures deemed appropriate and in accordance with current academic regulations, irregularities committed by a student that may lead to a variation in the grade will be graded with a zero (0). For example, plagiarizing, copying, copying, having communication devices (such as cell phones, smart watches, etc.) in an evaluation activity will involve suspending that evaluation activity with a zero (0). Assessment activities qualified in this way and by this procedure will not be recoverable. If it is necessary to pass any of these assessment activities to pass the course, this course will be suspended directly, without the opportunity to retake it in the same course. The numerical mark of the transcript will be the lower value between 3.0 and the weighted average of the marks in case the student has committed irregularities in an act of evaluation (and therefore it will not be possible to pass it by compensation).

## Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Delivery	20%	0	0	2, 1, 3, 4, 5, 6
Midterm exam II	40%	3	0.12	2, 1, 3, 4, 5, 6

**Bibliography**

Sanz i Solé, Marta. 'Probabilitats', Col·lecció UB.

Delgado de la Torre, Rosario. 'Probabilidad y Estadística con aplicaciones'

**Software**

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