

Degree programme	Type	Course
Biochemistry	OB	2

Contact lecturer

Name : Juan Carlos Cantero Guardado

Email : juancarlos.cantero@uab.cat

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

(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.

Learning outcomes

- CM03 (Interpret the specific terminology used in the field of mathematics and statistics, or proposed by specialists in this field.) Interpret the specific terminology used in the field of mathematics and statistics, or proposed by specialists in this field.
- CM04 (Estimate gender/sex-based inequalities using mathematical models and statistical analysis.) Estimate gender/sex-based inequalities using mathematical models and statistical analysis.
- CM05 (Develop mathematical models and biostatistical analysis in an ethically responsible manner and with respect for fundamental rights and duties, diversity and democratic values, in accordance with the Sustainable Development Goals.) Develop mathematical models and biostatistical analysis in an ethically responsible manner and with respect for fundamental rights and duties, diversity and democratic values, in accordance with the Sustainable Development Goals.
- KM09 (Describe the basic properties of point and interval estimators used for data analysis in biochemistry.) Describe the basic properties of point and interval estimators used for data analysis in biochemistry.
- SM05 (Use digital resources in calculations, graphic representations, simple mathematical models and statistical tests.) Use digital resources in calculations, graphic representations, simple mathematical models and statistical tests.
- SM06 (Select the appropriate statistical test for each situation and dataset.) Select the appropriate statistical test for each situation and dataset.
- SM07 (Interpret the results of statistical tests to draw informed data-based conclusions.) Interpret the results of statistical tests to draw informed data-based conclusions.

Contents

1.- Descriptive statistics and linear regression

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.

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Individual study	26	1.04	CM03, CM04, CM05, KM09, SM05, SM06, SM07
Theory classes	20	0.8	CM03, CM04, CM05, KM09, SM05, SM06, SM07
Tutorials	2	0.08	CM03, CM04, CM05, KM09, SM05, SM06, SM07
Practical works	14	0.56	CM03, CM04, CM05, KM09, SM05, SM06, SM07
Exercise resolution classes	4	0.16	CM03, CM04, CM05, KM09, SM05, SM06, SM07

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.

Assessment

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Exercises	20%	4	0.16	CM03, CM04, CM05, KM09, SM05, SM06, SM07
Mid-term exam	30%	2	0.08	CM03, CM04, CM05, KM09, SM05, SM06, SM07
Exam	50%	3	0.12	CM03, CM04, CM05, KM09, SM05, SM06, SM07

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.

Any irregularity in an assessment activity (academic fraud, plagiarism, or unauthorized use of AI, unless such use is explicitly permitted in the course syllabus) that may lead to a significant alteration of the grade will result in a mark of 0 for that assessment. If the course syllabus establishes a minimum grade in that assessment as a mandatory requirement to pass the course, or if multiple irregularities are committed in assessment activities for the same course, the final grade for the course will be 0. In addition, disciplinary proceedings may be initiated against any student involved in such irregularities.

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

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this [link](#). To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TE) Theory	32	Catalan	first semester	afternoon
(PAUL) Classroom practices	321	Catalan	first semester	afternoon
(PAUL) Classroom practices	322	Catalan	first semester	morning-mixed