UAB
Universitat Autònoma de Barcelona

Mathematics

Code: 101001
ECTS Credits: 6

2024/2025

Degree	Type	Year
2500502 Microbiology	FB	1

Contact

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Teachers

Marti Prats Soler

Teaching groups languages

You can view this information at the end of this document.

Prerequisites

We do not need any prerequisites for this subject, but we recommend to follow the propedèutic course in mathematics, if the student does not have a good level in mathematics.

Objectives and Contextualisation

In the context of microbiology studies, a solid mathematical training is essential, especially to be able to understand and use the function graphs, the differential calculus and the understanding of the models of growth, as well as basic statistical inference tools. Like in any university degree, It is essential that students reach a critical reasoning and respect for diversity and plurality of ideas, people and situations. In order to include a gender perspective in the subject, we include written bibliography for women and we will make special mention of scientific contributions from women related to the agenda of the subject, as well as we will include more women as protagonists of the statements of the problems that consider timely. Obviously, and something we already do, we will use non-sexist and androcentric language in all Written and visual or other documents of the subject.

The specific objectives of the subject are:

1. Understanding of the basic tools to draw and interpret graphs of functions.

2. Study of the growth of biological populations. The exponential growth and the logistic growth. use and interpretation of logarithmic graphs.

3. Acquisition of notions about interpretation of data, application of tests of hypothesis contrasts and calculation of confidence intervals. Use of computer tools for the statistical treatment of data.

Learning Outcomes

1. CM01 (Competence) Evaluate the results of mathematical calculation and basic statistical tests to provide innovative responses to society's needs and demands.
2. CM02 (Competence) Integrate the gender perspective in the analysis of statistical inference and give evidence of possible bias for reasons of sex or gender.
3. KM01 (Knowledge) Define the functions of a variable and basic tools for producing and interpreting functio graphs.
4. KM02 (Knowledge) Identify the derivative and differential equations as growth rate and as mathematical models of magnitude change respectively.
5. KM03 (Knowledge) Identify exponential growth and logistic growth through logarithmic graphics.
6. KM04 (Knowledge) Define the basic concepts of probability, descriptive statistics and statistical inference.
7. SM01 (Skill) Apply basic tools of mathematical calculation, function graphs and basic statistical inference to each situation and data set.
8. SM02 (Skill) Use computer resources to perform calculations, graphic representations, obtain simple mathematical models and perform basic statistical tests.

Content

Program

1. The derivative as a growth rate. Derivation rules. Growth and decline. Maxima, minima, convexity, concavity

2. Functions of one variable: graphical representation, parameter dependence, polynomial functions and rational functions. The exponential function. The number e. The logarithm function. experimentation Dimensional analysis. Logarithmic graphs.

3. The definite integral and the indefinite integral, primitives. Primitive calculation rules.

4.. Exponential growth and decline. Logistics growth. Differential equations as mathematical models of the change of magnitudes.

5.. Introduction to probability. Randomvariables and more frequent distributions. Binomial and normal law.

6. Descriptive statistics. Descriptive study of a variable: mean, deviation, bar diagrams. Samples, statistics.

7.. Introduction to statistical inference. Confidence intervals and hypothesis testing.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Computer practice	8	0.32	CM02, KM01, KM02, CM02
Problem sessions	14	0.56	CM01, CM02, KM03, KM04, CM01
Theory sessions	30	1.2	KM02, KM03, KM04, SM01, KM02

Type: Supervised				
Doubt clearing sessions student-professor	4	0.16	CM02, CM02	
Type: Autonomous				
At home work	40	1.6	KM04, SM01, SM02, KM04	
Problem solving	37	1.48	KM01, KM02, KM03, KM01	
Writing mathematics	12	0.48	CM01, CM02, KM01, CM01	

The subject consists of three main activities, plus complementary ones.*

There will be theory classes called "magistrals", which will only be "magistrals" in the form.

From the point of view of the content it is very difficult to distinguish between theory and problems and in fact the theory classes will be full of examples and exercises, and its theoretical part will be very limited. There will also be problem sessions, complementary to theory classes and where exercises will be solved without introducing new concepts. Finally sessions of two hours of practices will be held in the computer room, where specific software will be used for the mathematical calculation (Maple / Sage / Maxima) and possibly another more generic one (Excel) that will also be used for the Statistical practices. These activities will be tutorials in which doubts that have not been solved yet, will be clarified in the class.

The communication with the professors will preferably be face-to-face, although they can also be answer specific questions by email or through the Virtual Campus.

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	Weighting	Hours	ECTS	Learning Outcomes
First partial exam	35%	2.5	0.1	KM01, KM02, KM03
Problem deliveries	15%	0	0	CM01, CM02, KM01, KM02, KM03, KM04, SM01, SM02
Second partial exam	35%	2.5	0.1	CM02, KM04, SM01
computer exercises	15%	0	0	CM01, CM02, KM01, KM02, KM03, KM04, SM01, SM02

Competences in this subject will be assessed through continuous assessment, which will include written tests, practices and assignments.The evaluation system is organized into the following blocks, each of which will be assigned a specific weight in the final grade:
Practical block (BP) In this module, the performance of practicals and the presentation of reports and/or exercises related to them will be assessed. This module will have a global weight of 15%
Submissions (LLEX): In this block the student must submit solved problems. It will have a weight of 15%.
First partial, Second partial (P1,P2): This module will consist of two partial tests at the end of the two parts into which the subject is divided (Topics 1, 2, 3 and 4 and Topics 5, 6 and 7)
.Continuous assessment: if the practical block and assignments have been done, and the grades for each part are at least a 3, a grade $C1=(0.15)*BP+(0.15)*(LLEX) +(0.35)*(P1+P2)$ is generated

Recovery exam. In the event that C1<5, the student can take a recovery exam R with two parts R1,R2 corresponding to each partial, and a grade C2= (0.15)*BP+(0.15)*(LLEX)+(0.35)*(max(P1,R1)+max(P2,R2)). The final grade will be max(C1,C2).

It will be considered that a student obtains the grade of Non-evaluable if the number of assessment activities carried out is less than two-thirds of those scheduled for the subject.

Unique assessment. Students who have opted for it, on the day of the P2 partial, must

:- Deliver the practical BP block

- Deliver the two installments of LLEX exercises

- Take an F final exam with the entire syllabus

The grade will be C1=(0.15)*BP+(0.15)*(LLEX)+(0.70)*F. If C1<5, they can take a recovery exam R generating a grade C2=(0.15)*BP+(0.15)*(LLEX)+(0.70)*R

Bibliography

Batschelet, E., Matemáticas básicas para biocientíficos, Dossat, Madrid

Bardina, X., Farré, M., Estadística : un curs introductori per a estudiants de ciències socials i humanes Colecció Materials, Universitat Autònoma de Barcelona

Delgado de la Torre, R. Apuntes de probabilidad y estadística. Colecció Materials, Universitat Autònoma de Barcelona

Neuhauser, C. Matemáticas para ciencias, Prentice Hall Newby,

J.C. Mathematics for the Biological Sciences, Clarendon Press

Software

Maxima

Microsoft Excel

Language list

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	711	Catalan	second semester	morning-mixed
(PAUL) Classroom practices	712	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	711	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	712	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	713	Catalan	second semester	morning-mixed
(TE) Theory	71	Catalan	second semester	afternoon