UAB
Universitat Autònoma de Barcelona

# Mathematics

Code: 101001
ECTS Credits: 6

2025/2026

| Degree | Type | Year |
|---|---|---|
| Microbiology | FB | 1 |

## Contact

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## Teaching groups languages

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

## Prerequisites

There are no prerequisites. However, it would be advisable for students who feel they do not have a strong background in high school mathematics to review the topics and concepts covered at that level.

## 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) Definir las funciones de una variable y herramientas básicas para dibujar e interpretar gráficos de funciones.
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 | CM01, KM02, SM01, CM01 |
| Problem sessions | 14 | 0.56 | KM01, KM02, KM03, KM01 |
| Theory sessions | 30 | 1.2 | CM01, KM01, KM02, KM03, KM04, SM01, SM02, CM01 |
| Type: Supervised | | | |
| Doubt clearing sessions student-professor | 4 | 0.16 | CM02, CM02 |
| Type: Autonomous | | | |
| At home work | 40 | 1.6 | CM01, CM02, KM01, CM01 |
| Problem solving | 37 | 1.48 | KM04, SM01, SM02, KM04 |

| | | | | |
|---|---|---|---|---|
| Writing mathematics | 12 | 0.48 | KM01, KM02, KM03, KM01 | |

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

## Continous Assessment Activities

| Title | Weighting | Hours | ECTS | Learning Outcomes |
|---|---|---|---|---|
| computer exercises | 15% | 0 | 0 | |
| First partial exam | 35% | 1.5 | 0.06 | CM01, CM02, KM01, KM02, KM03, KM04, SM01, SM02 |
| Problem deliveries | 15% | 2 | 0.08 | CM01, CM02, KM01, KM02, KM03, KM04, SM01, SM02 |
| Second partial exam | 35% | 1.5 | 0.06 | CM01, CM02, KM01, KM02, KM03, KM04, SM01, SM02 |

The intended learning outcomes of this subject will be assessed through continuous assessment, which includes written exams, practical activities, and the submission of assignments.

The assessment system is structured into the following components, each with a specific weight in the final grade:

- Practical Component (BP): This component evaluates the completion of practical activities and the submission of related reports and/or exercises. It accounts for 15% of the final grade.
- Assignments (LLEX): Students must submit solved problem sets. This component also accounts for 15%of the final grade.
- First and Second Midterm Exams (P1, P2): These are two written exams held at the end of each part of the course (covering Topics 1-4 and Topics 5-7, respectively).

### Continuous Assessment Criteria

If min(P1, P2) > 3 and both the practical component and the assignments have been completed, a grade is calculated as:

C1 = (0.15 × BP) + (0.15 × LLEX) + (0.35 × (P1 + P2))

### Resit Assessment

If C1 < 5 or min(P1, P2) < 3, the student must take a resit exam (R), consisting of two parts (R1 and R2), corresponding to each midterm. A new grade is then calculated as:

C2 = (0.15 × BP) + (0.15 × LLEX) + (0.35 × (max(P1, R1) + max(P2, R2)))

The final grade will be min(5, C1, C2)

A student will be considered Not Assessable if they complete fewer than two-thirds of the scheduled assessment activities.

### Single Assessment Option

Students who opt for the single assessment must, on the day of the second midterm (P2):

- Submit the practical component (BP)
- Submit both sets of assignments (LLEX)
- Take a final exam (F) covering the entire syllabus

A grade is calculated as:

C1 = (0.15 × BP) + (0.15 × LLEX) + (0.70 × F)

If C1 < 5, students may take a resit exam (R), and a new grade is calculated as:

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

## Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this link. To consult the language you will need to enter the CODE of the subject.

| 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 |