

Degree programme	Type	Course
Microbiology	FB	1

Contact lecturer

Name : Jordi Villadelprat Yague

Email : jordi.villadelprat@uab.cat

Teaching staff

Carles Barril Basil

Group languages

You can consult this information at the [end](#) of the 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

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

- CM01 (Evaluate the results of mathematical calculation and basic statistical tests to provide innovative responses to society's needs and demands.) Evaluate the results of mathematical calculation and basic statistical tests to provide innovative responses to society's needs and demands.
- CM02 (Integrate the gender perspective in the analysis of statistical inference and give evidence of possible bias for reasons of sex or gender.) Integrate the gender perspective in the analysis of statistical inference and give evidence of possible bias for reasons of sex or gender.
- KM01 (Definir las funciones de una variable y herramientas básicas para dibujar e interpretar gráficos de funciones.) Definir las funciones de una variable y herramientas básicas para dibujar e interpretar gráficos de funciones.
- KM02 (Identify the derivative and differential equations as growth rate and as mathematical models of magnitude change respectively.) Identify the derivative and differential equations as growth rate and as mathematical models of magnitude change respectively.
- KM03 (Identify exponential growth and logistic growth through logarithmic graphics.) Identify exponential growth and logistic growth through logarithmic graphics.
- KM04 (Define the basic concepts of probability, descriptive statistics and statistical inference.) Define the basic concepts of probability, descriptive statistics and statistical inference.
- SM01 (Apply basic tools of mathematical calculation, function graphs and basic statistical inference to each situation and data set.) Apply basic tools of mathematical calculation, function graphs and basic statistical inference to each situation and data set.
- SM02 (Use computer resources to perform calculations, graphic representations, obtain simple mathematical models and perform basic statistical tests.) Use computer resources to perform calculations, graphic representations, obtain simple mathematical models and perform basic statistical tests.

Contents

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.

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Computer practice	8	0.32	CM01, KM02, SM01
Doubt clearing sessions student-professor	4	0.16	CM02
Writing mathematics	12	0.48	KM01, KM02, KM03
Problem solving	37	1.48	KM04, SM01, SM02
At home work	40	1.6	CM01, CM02, KM01
Problem sessions	14	0.56	KM01, KM02, KM03
Theory sessions	30	1.2	CM01, KM01, KM02, KM03, KM04, SM01, SM02

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 and possibly another more generic one 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	Weight	Hours	ECTS	Learning outcomes
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
computer exercises	15%	0	0	CM01, CM02, KM01, KM02, KM04, SM01, SM02
Second partial exam	35%	1.5	0.06	CM01, CM02, KM01, KM02, KM03, KM04, SM01, SM02

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) This block will assess the completion of practical work and the submission of reports and/or exercises related to them. This module will have an overall weight of 15%.

Submissions (LLEX): In this block the student must submit solved problems. It will have a weight of 15%.

First partial exam, Second partial exam (P1, P2): This module will consist of two partial exams 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 $\min(P1, P2) > 3$ and the practical block and submissions have been completed, then a grade is generated:

$$C1 = (0.15) * BP + (0.15) * (LLEX) + (0.35) * (P1 + P2).$$

If $C1$ is greater than or equal to 5, then the final grade for the subject is $C1$. In the event that $C1 < 5$ or $\min(P1, P2) < 3$, the student must take a resit exam R with two parts $R1$ and $R2$ corresponding to each partial exam, and a grade is generated:

$$C2 = (0.15) * BP + (0.15) * (LLEX) + (0.35) * (\max(P1, R1) + \max(P2, R2)).$$

If $\max(P1, R1) > 3$ and $\max(P2, R2) > 3$ then the final grade is $\min(6, C2)$. Otherwise the final grade will be $\min(4, C1)$.

Single assessment. Students who have opted for it, on the day of the partial exam $P2$, must:

- Submit the practical block BP
- Submit the two exercise submissions LLEX
- Take a final exam F covering the entire syllabus

The final exam consists of two parts, $F1$ and $F2$, corresponding to Topics 1, 2, 3 and 4 and Topics 5, 6 and 7, respectively. A minimum score of 3 must be obtained in each part, and in this case a grade is generated:

$C1 = (0.15) * BP + (0.15) * (LLEX) + (0.70) * F$. If $C1 < 5$ or $\min(F1, F2) < 3$, the student will take the resit exam R , which is assessed in the same way as in continuous assessment.

A student will be considered to obtain a grade of Not Assessable if the number of assessment activities completed is less than two thirds of those scheduled for the subject.

NOTE: In this subject, the use of Artificial Intelligence (AI) technologies is not permitted at any stage. Any work that includes fragments generated with AI will be considered an act of academic dishonesty and may result in a partial or total penalty on the activity grade, or more serious sanctions in severe cases.

The commission of any irregularity in an assessment activity (academic fraud, plagiarism, or improper use of AI, unless such use is expressly authorized in the course syllabus) that may lead to a significant change in the grade will result in that activity being graded with a 0. If the course syllabus stipulates that passing the subject requires having obtained a minimum grade in that assessment activity, or if several irregularities occur in the assessment activities of the same subject, the final grade for that subject will be 0. Independently of this, disciplinary proceedings may be initiated against a student who commits any of these irregularities.

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

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	71	Catalan	second semester	afternoon
(PAUL) Classroom practices	711	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	711	Catalan	second semester	morning-mixed
(PAUL) Classroom practices	712	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	712	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	713	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	714	Catalan	second semester	morning-mixed