UAB
Universitat Autònoma de Barcelona

Mathematics

Code: 107948
Credits: 4

2026/2027

Degree programme	Type	Course
Environmental Biology	OB	1

Contact lecturer

Name : Silvia Cuadrado Gavilan

Email : silvia.cuadrado@uab.cat

Teaching staff

Teodoro Mayayo Cortasa

Group languages

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

Prerequisites

Rational and real numbers, numerical approximation, and exponential notation. Absolute value and inequalities.

Elementary functions: linear, polynomial, rational, exponential, logarithmic, and trigonometric.

Solving systems of linear equations.

Basic concepts of differential and integral calculus.

Objectives

In the context of Environmental Biology studies, a solid mathematical background is essential. With this in mind, this course has a twofold objective. First, it aims to provide students with the necessary mathematical training in the fields of linear algebra and differential calculus. Second, it seeks to equip them with the tools to develop mathematical models for selected problems in Biology.

Learning outcomes

- CM02 (Integrate relevant mathematical data to make judgments applied to the field of environmental biology and that include multidisciplinary reflection.) Integrate relevant mathematical data to make judgments applied to the field of environmental biology and that include multidisciplinary reflection.
- KM05 (Describe natural phenomena in the field of biology through mathematics.) Describe natural phenomena in the field of biology through mathematics.
- KM06 (Apply exponential, logarithmic and potential functions to solve biological problems.) Apply exponential, logarithmic and potential functions to solve biological problems.
- KM07 (Produce vectors and matrices, recognizing the simplification that this entails in solving problems

of biological interest.) Produce vectors and matrices, recognizing the simplification that this entails in solving problems of biological interest.
- SM03 (Apply the basic concepts of linear algebra, differential calculus, and integral calculus to solve and model biological problems and ecological data.) Apply the basic concepts of linear algebra, differential calculus, and integral calculus to solve and model biological problems and ecological data.
- SM04 (Apply classical mathematical models to the population growth of different living organisms.) Apply classical mathematical models to the population growth of different living organisms.

Contents

1. A brief review

1.1 The derivative. Geometric and kinematic interpretations. Chain rule. Growth and decay. Maxima, minima, and optimization. Graphs.

1.2 The integral. The fundamental theorem of calculus. Antiderivative calculation. Applications.

2. Differential equations

2.1 Differential equations with separable variables. Exponential growth. Mass balances. The logistic differential equation.

2.2 Linear equations. Mass balances.

2.3 Geometric interpretation of differential equations. The initial value problem.

3. Linear algebra

3.1 Systems of linear equations, matrices, and matrix computation.

3.2 Eigenvalues and eigenvectors. Diagonalization.

3.3 Discrete-time population dynamics: iteration. Age dependence.

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes

tutorial assistance	6	0.24	CM02, KM05, KM06, KM07, SM03, SM04
Studying	47	1.88	CM02, KM05, KM06, KM07, SM03, SM04
oral expositions	19	0.76	CM02, KM05, KM06, KM07, SM03, SM04
practical classes	14	0.56	CM02, KM05, KM06, KM07, SM03, SM04

The theoretical lectures will cover the different topics that make up the course. These lectures provide students with the scientific knowledge specific to the subject.

Problem-solving sessions are essential for a thorough understanding of this knowledge. These sessions will be organized around a set of exercises that students are expected to attempt and solve.

This will be complemented by tutorial sessions, during which questions will be addressed and the results of the different continuous assessment activities will be discussed.

Students will also be required to complete assignments consisting of the preparation and solution of exercises. These assignments will contribute 15% to the final grade.

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
3. Submission of exercises	15%	4	0.16	CM02, KM05, KM06, KM07, SM03, SM04
1. Partial exam	35%	4	0.16	CM02, KM05, KM06, KM07, SM03, SM04
2. Global exam	50%	6	0.24	CM02, KM05, KM06, KM07, SM03, SM04

The final grade for the course will consist of several components:

- Quizzes/assignment submissions, which may be completed during class time (15%). This activity cannot be retaken.
- Two assessments for the course: a midterm exam (35%) and a final exam (50%). It is mandatory to score at least 3.5 out of 10 on the final exam in order to avoid the make-up exam.

Students who do not achieve a final grade of 5 or higher may take a make-up exam, which will account for 85% of the final grade.

Honors distinctions will be awarded based on the first full evaluation of the course. They will not be granted to another student who achieves a higher grade after the make-up exam.

Students will receive a \"Not Assessable\" grade if the evaluation activities they complete account for less than 50% of the final grade.

Students choosing the single assessment option will take a comprehensive final exam on the same day as the final exam for the rest of the class. This exam will include a section related to the assignments completed by other students. If the student fails this exam, they may take the make-up exam on the same day as the make-up exam for the rest of the class, under the conditions previously described.

Use of AI

In this course, the use of Artificial Intelligence (AI) technologies is not permitted at any stage. Any assignment that includes fragments generated by AI will be considered a breach of academic integrity and may result in a partial or total penalty in the grade of the activity, or more severe sanctions in serious cases.

Bibliography

There is no text book fitting exactly the content of the subject. The following text books cover different parts of the course.

- Matemàtiques i modelització per a les ciències ambientals, Jaume Aguadé, Dipòsit digital de documents de la UAB

- Matemáticas para ciencias de C. Neuhauser (Pearson, Prentice Hall)

- Matemáticas básicas para biocientíficos de E. Batschelet (Editorial Dossat)

- Mathematical ideas in Biology de J. Maynard Smith (Cambridge U.P.)

- Introducción al álgebra lineal, H. Anton (Editorial Limusa)

Software

No mathematical software is used

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	21	Catalan	first semester	afternoon
(PAUL) Classroom practices	211	Catalan	first semester	afternoon
(PAUL) Classroom practices	212	Catalan	first semester	afternoon