Mathematics

Code: 100814
ECTS Credits: 6

2024/2025

Degree	Type	Year
2500251 Environmental Biology	FB	1

Contact

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Teachers

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Teaching groups languages

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

Prerequisites

The prerequisites of this subject are those given at the preparatory course in mathematics offered by the Facultat de Biociències.

Objectives and Contextualisation

For a university degree in Biologia Ambiental it is important to achieve a solid mathematical formation. In this sense, this subject has a double aim. On one hand, to give the student the necessary mathematical background in the fields of linear algebra and differential calculus, allowing him/her, and this is the second aim, to build up mathematical models for some biological problems.

Competences

- Design models of biological processes.
- Display basic knowledge of mathematics, physics and chemistry.
- Focus on quality.
- Reason critically.
- Solve problems.

Learning Outcomes

1. Focus on quality.
2. Handle exponential, logarithmic and potential functions with ease, and apply these to solving problems in biology: acceleration of metabolism with the temperature, decomposition of organic matter, allometries.
3. Handle vectors and matrices with ease, and appreciate how these can simplify problem-solving in biology: projection of the size of a population, quantitative genetics and ordering methods in multivariable analysis.
4. Reason critically.
5. Solve problems.
6. Use rudimentary calculus by formulating and solving models of interest in biology: model of exponential growth of populations.

Content

Part I. Fundamental mathematics

1. Real numbers and functions in one variable

2. Limits and derivation of functions

2.1 Limits and continuity.

2.2 Derivative. Geometric and kinematical interpretations. Chain rule.

3. Graphical representation of functions

3.1 Domain of definition and asymptotes.

3.2 Increase. Convexity. Maximal and mínimal values.

4. Integration of functions

4.1 Primitives. Integral. Fundamental Theorem of Calculus.

4.2 Computation of areas and volumes.

Part II. Biomathematics.

5. Differential equations

5.1 Separation of variables. Exponential growth, radioactive disintegration, logistic equation.

5.2 Linear equations. Examples.

6. Population dynamics

6.1 Matrices, proper vectors and proper values. Diagonalization.

6.2 Linear population growth. Ecosystems with species in competence.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes

Type: Directed			
oral expositions	26	1.04	1, 4, 5, 6
practical classes	25	1	1, 4, 5, 6
Type: Supervised			
tutorial assistance	6	0.24	1, 4, 5, 6
Type: Autonomous			
Problem solving	30	1.2	1, 4, 5, 6
Special exercises	15	0.6	1, 4, 5, 6
Studying	34	1.36	1, 4, 5, 6

Oral expositions will be devoted to transmit the different topics and scientific knowledge of the subject to the student.

Problem sessions are fundamental for the student to achieve a deep understanding of these contents. These classes are organized around a list of problems that the students try to solve.

This is complemented with individual tutorial assistance to clarify some doubts, or to discuss the results of the diferent evaluation activities.

The student will have to solve some special exercices, which contribute with a 15% to the final marks.

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
1. Partial exam	35%	4	0.16	1, 2, 3, 4, 5, 6
2. Global exam	50%	6	0.24	1, 2, 3, 4, 5, 6
3. Submission of exercises	15%	4	0.16	1, 2, 3, 4, 5, 6

The partial exam will be taken by the half of the term and it will include the topics explained up to then. The global exam wil include the whole content of the subject.

Besides these two exams there will be a recovery exam for those students who did not pass the subject. This recovery exam will weight 85% of the final mark. The resting 15% will continue to be the submission of exercises mark, which admits no reevaluation.

The student who did not pass the course and does not take the recovery exam will receive a qualification of "No Avaluable".

Unique evaluació. Unique evaluation consists in a unique exam on all content of the subject. The grade of this exam will determine 100% of the finasl qualification .

This unique evaluation exam will take place the same day and hour (and in the same classroom) than the last continued-evaluation exam of the subject. If a student fails this unique evaluation exam, he/she will have right to participate in the standard last-chance exam of the subject.

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.)

Software

No mathematical software is used

Language list

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	211	Catalan	first semester	morning-mixed
(PAUL) Classroom practices	212	Catalan	first semester	morning-mixed
(TE) Theory	21	Catalan	first semester	morning-mixed