

Basics of Mathematics

Code: 106747
ECTS Credits: 6

2025/2026

Degree	Type	Year
Environmental Sciences	FB	1

Contact

Name: Joaquín Martín Pedret
Email: joaquin.martin@uab.cat

Teaching groups languages

You can view this information at the [end](#) of this document.

Prerequisites

Although there are no official prerequisites, it is essential that students have a very good command of the most basic concepts of mathematics. They must have a solid understanding of the calculus taught in upper secondary school: limits, continuity and derivability of real functions of a real variable; concepts of integral calculus, which will enable them to pass the PAU mathematics exam without any problems. Students who do not have a minimum background in mathematics will have to make an effort to address these deficiencies.

Objectives and Contextualisation

On one hand, we will review all fundamental concepts that have been worked at high school. On the other hand, we will introduce some new concepts (as differential equations or calculus in several variables). But the most important point will be the emphasis in the use of these techniques in the mathematical modelization of several areas of interest.

Learning Outcomes

1. CM01 (Competence) Work on basic real mathematical problem resolution applied to the environmental field.
2. CM02 (Competence) Transmit the basic mathematical information related to an environmental problem to the general public correctly.
3. KM01 (Knowledge) Identify the basic relationships between the principles and foundations of Mathematics and environmental processes.
4. KM02 (Knowledge) Recognise the tools and basic concepts of calculus and algebra.
5. KM03 (Knowledge) Recognise basic flat and spatial geometry problems, as well as basic maths optimisation problems.
6. KM04 (Knowledge) Identify the rules for re-routing and taking on functions, as well as the basic results of differential calculus using various real variables.
7. SM01 (Skill) Set out the resolution of basic mathematical problems associated with the environment.
8. SM02 (Skill) Resolve basic flat and spatial geometry problems, as well as basic maths optimisation problems.
9. SM03 (Skill) Outline the derivation and incorporation of simple functions, as well as the resolution of basic differential calculus problems.

10. SM04 (Skill) Express yourself correctly using basic mathematical language.

Content

1. Elementary functions
2. Limits and continuity
3. The derivative and its applications
4. The integral and its applications
5. Introduction to differential equations
6. Matrices, vectors and 3D geometry
7. Functions of several variables

In each of these topics, a theoretical summary of the fundamental concepts and techniques will be presented and immediately followed by examples of the application of these concepts and techniques to relevant topics in Environmental Sciences. For example: population growth, decline and extinction, biodiversity, allometry, logistic curve and sustainability, equilibria, predator/prey models, half-life, seasonal pollution models, social inequality index, natural selection models, disease transmission, the Allee effect, stratified population matrix models, social mobility matrix, etc.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Classroom Practices (problem solving classes)	12	0.48	
Theory	38	1.52	
Type: Supervised			
Practical tests and / or delivery of problems	17	0.68	
Type: Autonomous			
Theory	44	1.76	
To prepare partial exams and to realize partial exams.	15	0.6	

The course will be given in person.

The students will receive a list of exercises on which they will work, trying to solve them. During your non-classroom activity, you will have read and worked the proposed exercises and problems, as well as the theoretical notions necessary for the resolution of the exercises. This will guarantee your participation in the classroom and will facilitate the assimilation of the procedural contents.

The teaching of the course will use the virtual campus as a means of communication, as well as virtual teaching media. It is recommended to use the institutional e-mail of the professors that appears in this guide. Students who wish to communicate with professors by e-mail should do so from the institutional address provided by the university (@autonoma.cat). Naturally, students will have tutoring hours (to be arranged) in the professors' offices.

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
Partial exam 1	30%	2	0.08	KM01, KM02, KM03, KM04, SM01, SM02, SM03, SM04
Partial exam 2	40%	2	0.08	KM01, KM02, KM03, KM04, SM01, SM02, SM03, SM04
Resolution of problems and/or delivery of evaluable problems	30%	20	0.8	CM01, CM02, KM01, KM02, KM03, KM04, SM01, SM02, SM03, SM04

a) Process and scheduled assessment activities

The course consists of the following assessment activities

Recoverable activities:

Two mid-term exams E1 and E2 with a weight of 70% of the final grade (30% for the first and 40% for the second).

Non-recoverable activities:

Several practical tests (and/or problem deliveries) via virtual campus with a weight of 30% of the final grade that will give a P grade.

Grading of the course:

Continuous assessment.

If $NE = (E1 + E2)/2 < 2.5$, the subject is failed with final grade NE.

If $2.5 \leq NE < 3.5$ you have to go to the recovery.

If $NE \geq 3.5$ then the final grade F is calculated:

$$F = 0.3E1 + 0.4E2 + 0.3P$$

If $F \geq 5$ the subject is passed with grade F, otherwise go to the recovery.

b) Recovery process:

To be able to take the recovery, $NE = (E1 + E2)/2 \geq 2.5$.

There will be a make-up exam that will give a grade R, so

If $R < 2.5$ the subject is failed with final grade R.

If $R \geq 2.5$ the grade of the subject is

$$F = \min(0.7R + 0.3P, 7)$$

c) Grade improvement

Students can take the make-up exam to improve their grade, but they must be aware that they can get a lower grade.

d) Programming of evaluation activities:

The schedule of assessment activities will be given on the first day of the subject and will be made public through the Virtual Campus and to the website of the Faculty of Sciences to the section on exams.

e) Procedure for the review of grades:

For each recoverable assessment activity, a place, date and time of review will be indicated in which the students will be able to review the activity with the teaching staff.

In this context, claims may be made about the grade of the activity, which will be evaluated by the teaching staff responsible for the subject.

Students who do not attend the review on the date and at the place booked will not be able to review the activity at a later date.

f) Grades:

Honours. It is the decision of the lecturer responsible for the subject to award an honours mark.

UAB regulations state that MH may only be awarded to students/subjects that have obtained a final grade of 9.00 or higher.

Up to 5% of the total number of students may be awarded MHs.

The student will be considered to have taken the course if he/she takes at least one recoverable and/or one non-recoverable activity.

g) Consequences of irregularities committed by students: copying, plagiarism, etc.

Without prejudice to other disciplinary measures deemed appropriate, and in accordance with current academic regulations, irregularities committed

by a student that may lead to a variation of the grade in an evaluable activity will be graded with a zero (0).

Assessment activities graded in this way and by this procedure will not be recoverable.

If it is necessary to pass any of these assessment activities in order to pass the subject, this subject will be directly failed,

without the opportunity to recover it in the same course. These irregularities include, among others

- total or partial copying of a practical, report, or any other assessment activity; - allowing copying;
- submitting group work not done in its entirety by the members of the group (applied to all members, not just those who have not worked);
- unauthorised use of AI (e.g. Copilot, ChatGPT or equivalent) to solve exercises, practicals and/or any other assessable activity;
- submitting as one's own materials produced by a third party, even if they are translations or adaptations, and in general work with elements that are not original and unique to the student;

- have communication devices (such as mobile phones, smart watches, camera pens, etc.) accessible during individual theoretical and practical assessment tests (examinations);

- talking to fellow students during individual theoretical and practical assessment tests (examinations);

- copying or attempting to copy other students during theory/practical assessment tests (examinations);

- using or attempting to use written material related to the subject matter during theory and practical assessment tests (examinations), when this has not been explicitly permitted.

In short: copying, allowing copying or plagiarism (or the attempt to) in any of the assessment activities is equivalent to a SUSPENSION, not compensable and without validation of parts of the subject in subsequent years.

h) Single assessment:

Students who have opted for the single assessment mode will have to take a final test consisting of a theory exam where they will have to develop a topic and/or will have to answer a series of short questions.

Afterwards, they will have to do a problem/practical test where they will have to solve a series of exercises similar to those that have been worked on in the Practical/Classroom Problem sessions.

The grade will be the weighted average of the two previous activities, where the theory exam will account for 30% of the grade and the problems/practical exam for 70%.

If the final grade does not reach 5, failed students will have another opportunity to pass the subject by means of a make-up exam to be held on a date to be set by the degree coordination office.

In order to sit the make-up exam, students must have obtained a minimum grade of 3.5.

The revision of the final grade follows the same procedure as for the continuous assessment.

This English version of the guide is a translation of the Catalan version, in case of any discrepancy between the two, the correct version for all purposes is the Catalan one.

Bibliography

Basic

"Matemàtiques i modelització per a les Ciències Ambientals" de J. Agudé

(This is a digital book of free access that can be download from the UAB Library webpages).

Supplementary

"Matemáticas para ciencias" . 2a, edición, Pearson, Prentice Hall. Neuhauser, C.

(Students will found many examples, solved problems results and exercises that will help to study the subject).

Software

We will use (if is necessary) the free SAGE Software.

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	1	Catalan	first semester	afternoon
(PAUL) Classroom practices	2	Catalan	first semester	afternoon
(TE) Theory	1	Catalan	first semester	afternoon