Basics of Mathematics

2023/2024

Code: 106747
ECTS Credits: 6

Degree	Type	Year	Semester
2504604 Environmental Sciences	FB	1	1

Contact

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Teaching groups languages

You can check it through this link. To consult the language you will need to enter the CODE of the subject. Please note that this information is provisional until 30 November 2023.

Prerequisites

High school math.

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 o calcules in seeral 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

- CM01 (Competence) Work on basic real mathematical problem resolution applied to the environmental field.
- CM02 (Competence) Transmit the basic mathematical information related to an environmental problem to the general public correctly.
- KM01 (Knowledge) Identify the basic relationships between the principles and foundations of Mathematics and environmental processes.
- KM02 (Knowledge) Recognise the tools and basic concepts of calculus and algebra.
- KM03 (Knowledge) Recognise basic flat and spatial geometry problems, as well as basic maths optimisation problems.
- 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.
- SM01 (Skill) Set out the resolution of basic mathematical problems associated with the environment.

- SM02 (Skill) Resolve basic flat and spatial geometry problems, as well as basic maths optimisation problems.
- SM03 (Skill) Outline the derivation and incorporation of simple functions, as well as the resolution of basic differential calculus problems.
- 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/take 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.

Methodology

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.

Activities

Title	Hours	ECTS	Learning Outcomes

Type: Directed			
Classroom Practices (problem solving classes)	12	0.48	
Theory	38	1.52	CM02, KM01, KM02, KM03, KM04, SM01, SM02, SM03, SM04, CM02
Type: Supervised			
Practical tests and / or delivery of problems	17	0.68	CM01, KM02, KM03, KM04, SM01, SM02, SM03, SM04, CM01
Type: Autonomous			
Theory	44	1.76	CM01, KM02, KM03, KM04, SM01, SM02, SM03, SM04, CM01
To prepare partial exams and to realize partial exams.	15	0.6	CM01, CM02, KM01, KM02, KM03, KM04, SM01, SM02, SM03, SM04, CM01

Assessment

a) Programmed evaluation process and activities

The course consists of the following evaluation activities.

Recoverable activities:

Two midterm exams E1 and E2 with a weight of 60% of the final grade (25% the first one and 35% the second one).

Non-recoverable activities:

Several practical tests and/or problem deliveries with a weight of 40% of the final grade that will give a P grade.

To pass the course, by means of the continuous evaluation, it will be necessary that:

$F = 0{,}25E1 + 0{,}35E2 + 0{,}4P >= 5$.

If any of the above parameters is not met, then the final grade will be the minimum between F and 4.5.

b) Scheduling of evaluation activities:

The schedule of evaluation activities will be given on the first day of the course and will be made public through the Virtual Campus
and on the website of the Faculty of Sciences in the section of exams.

c) Recovery process:

There will be a make-up exam where it will be possible to recover the recoverable activities. To be able to take the make-up exam it will be necessary that $0.25E1 + 0.35E2 >= 3.5$.

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

d) Grade review procedure:

For each evaluation activity, a place, date and time of review will be indicated in which students may review the activity with the faculty.

In this context, claims may be made on the grade of the activity, which will be evaluated by the faculty responsible for the subject.
Students who do not attend this review will not be able to subsequently review this activity.
e) Grades:

Honors. Awarding a grade of honors is the decision of the faculty responsible for the course.
UAB regulations state that MHs may only be awarded to students who have obtained a final grade equal to or higher than 9.00.
Up to 5% of the total number of students enrolled 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.

f) Consequences of irregularities committed by the students: copying, plagiarism, ...

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.
The evaluation activities graded in this way and by this procedure will not be recoverable.
If it is necessary to pass any of these evaluation activities to pass the course, this course will be suspended directly, without the opportunity to recover it in the same course.
These irregularities include, among others.

- total or partial copying of a practice, report, or any other evaluation activity; - allowing copying.

- submitting group work that has not been fully completed by group members (applied to all members, not just those who have not worked);

- unauthorized use of AI (e.g., Copilot, ChatGPT or equivalent) to solve exercises, practices and/or any other evaluable activity.

- submitting as their own materials produced by a third party, even if they are translations or adaptations, and work with elements that are not original and unique to the student.

- having communication devices (such as cell phones, smart watches, camera pens, etc.) accessible during individual theoretical-practical evaluation tests (exams);

- talking to fellow students during individual theoretical-practical evaluation tests (exams);

- copying or attempting to copy from other students during the theoretical-practical evaluation tests (exams);

- using or attempting to use writings related to the subject matter during the theoretical-practical evaluation tests (exams), when these have not been explicitly permitted.

In summary: copying, allowing copying or plagiarizing (orthe attempt to) in any of the evaluation activities is equivalent to a SUSPENSION, not compensable and without validation of parts of the subject in subsequent courses.

g) Single evaluation:

Students who have opted for the single evaluation mode must take a final test consisting of a theory exam where they must develop a topic and/or answer a series of brief questions.
Afterwards, they will have to take a problem/practical test where they will have to solve a series of exercises like those that have been worked on in the Practical/Classroom Problems sessions.
The grade will be the weighted average of the two previous activities, in which 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, the failed students have another opportunity to pass the course through the recovery exam to be held on the date set by the coordination of the degree.
To be able to take the make-up exam, it will be necessary to have obtained a minimum grade of 3.5.

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

The proposed teaching methodology and evaluation may undergo some modification depending on the restrictions imposed by the health authorities.

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.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Partial exam 1	25%	2	0.08	CM01, CM02, KM01, KM02, KM03, KM04, SM01, SM02, SM03, SM04
Partial exam 2	35%	2	0.08	CM01, CM02, KM01, KM02, KM03, KM04, SM01, SM02, SM03, SM04
Resolution of problems and/or delivery of evaluable problems	40%	20	0.8	CM01, CM02, KM01, KM02, KM03, KM04, SM01, SM02, SM03, SM04

Bibliography

Basic

"Matemàtiques i modelització per a les Ciències Ambientals" de J. Aguadé. (Es tracta d'un llibre digital d'accés lliure que es pot descarregar a les pàgines web de les biblioteques de l'Autònoma).

Supplementary

"Matemáticas para ciencias" . 2a, edición, Pearson, Prentice Hall. Neuhauser, C., (L'alumnat hi trobarà molts exemples, problemes resolts i exercicis, que l'ajudaran en l'estudi de l'assignatura).

Software

We will use the free SAGE Software