

Mathematics I

Code: 102345
ECTS Credits: 6

Degree	Type	Year	Semester
2501572 Business Administration and Management	FB	1	1
2501573 Economics	FB	1	1

Contact

Name: Ricard Esparza Masana
Email: Ricard.Esparza@uab.cat

Use of languages

Principal working language: catalan (cat)
Some groups entirely in English: Yes
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: Yes

Teachers

Sergio Baena Mirabete
Maria Beatriz Quiros Blasco
Silvia Cuadrado Gavilán
Maria del Mar Gómez Pujalte
Albert Clop Ponte

Prerequisites

Pre-requisites previously achieved are not established. However, the course assumes that the student reaches the level with sufficient notices of maths acquired in secondary/high school. It is strongly recommended that those students with math difficulties or with too basic notions (especially those who have not studied higher levels of maths in high school) participate in the preparation programme organised by the Faculty and/or other preparatory actions in order to have the right tools to pass the course satisfactorily.

Objectives and Contextualisation

The Mathematics I course has a levelling role, which must allow the student to acquire and consolidate their knowledge and skills to understand and correctly manipulate the basic mathematical concepts and tools related to the analysis of a real variable. In addition, it must be possible to plan and work, in the environment of a variable, with simple models and problems that have components of economics and business. This knowledge, together with that of Mathematics II, will allow the student to have the necessary tools to study the most advanced subjects, which require the use of these mathematical instruments.

For this reason, the objectives that are intended to be achieved are the following:

1. Familiarise the student with the formulation and mathematical reasoning.
2. To introduce the role of mathematical models in economics and business.

3. Identify and know how to manipulate the main families of functions.
4. Work with derivatives and solve function limits of a variable.
5. Understand and know how to determine the basic properties that exhibit the functions of a variable.
6. Represent graphically functions of a variable.
7. Solve optimisation problems with one variable.
8. Determine and calculate primitives using the basic integration techniques.

Skills

Business Administration and Management

- Apply mathematical instruments to synthesise complex economic-business situations.
- Capacity for oral and written communication in Catalan, Spanish and English, which enables synthesis and oral and written presentation of the work carried out.
- Demonstrate an understanding of mathematical language and some methods of demonstration.
- Organise the work in terms of good time management, organisation and planning.
- Use of the available information technology and adaptation to new technological environments.

Economics

- Demonstrate an understanding of mathematical language and some methods of demonstration.

Learning outcomes

1. A capacity of oral and written communication in Catalan, Spanish and English, which allows them to summarise and present the work conducted both orally and in writing.
2. Analyse and draw functions.
3. Analytically consider and solve optimisation problems in the context of the economy.
4. Be able to work with inequalities and sequences.
5. Calculate and study the extrema of functions.
6. Calculate the functional integrals of a variable.
7. Deduce the properties of a function based on its graph.
8. Organise work, in terms of good time management and organisation and planning.
9. Solve problems that involve considering integrals in problems in the context of the economy (consumer and producer surplus, etc.).
10. Use available information technology and be able to adapt to new technological settings.
11. Work intuitively, geometrically and formally with the notions of limits, derivatives and integrals.

Content

PART I. INTRODUCTION

Topic 1. **BASIC CONCEPTS**

- 1.1. Basics: variables, constants, parameters, equations and identities
- 1.2. The real number: concept and absolute value
- 1.3. The real line: distance, inequalities, intervals and intervals

Topic 2. **BASICS OF ALGEBRA AND BASIC OPERATIONS**

- 2.1. Growth rates
- 2.2. The use of logarithms. Applications to the economy

2.3. Calculation with fractions, powers and roots

2.4. Simplification of mathematical expressions

PART II. STUDY AND REPRESENTATION OF FUNCTIONS

Topic 3. **FUNCTIONS**

3.1. Real functions of a variable; domain and image

3.2. Type of functions and properties

3.3. Operations with functions

Topic 4. **DIFFERENTIATION**

4.1. The concept of derivative. Economic and geometric interpretation

4.2. The derived function. Differentiation rules

Topic 5. **CONTINUITY**

5.1. Limits and indeterminations

5.2. Study of the continuity of a function

Topic 6. **STUDY AND REPRESENTATION OF FUNCTIONS**

6.1. Differentiable functions

6.2. Basic study of functions; cutting points and symmetries

6.3. Asymptotes

6.4. Interval of monotony of functions. Increase, decrease and local extremities

6.5. Concavity and convexity of functions

6.6. Curvature of functions. Maximum, minimum and turning points

6.7. Graphical representation of functions

PART III. OPTIMISATION WITH A VARIABLE

Topic 7. **OPTIMISATION WITH A VARIABLE**

7.1. Optimisation issues. Local extremities and optimum solutions

7.2. Optimisation at closed intervals. The Weierstrass theorem

PART IV. PRINCIPLES OF INTEGRATION

Topic 8. **INTRODUCTION TO INTEGRATION**

8.1. The concept of integral

8.2. Primitives and the calculation of integrals

8.3. Defined Integrals

Topic 9. **PRIMITIVE CALCULUM METHODS**

9.1. Integration by parts

9.2. Integration by substitution

Methodology

To achieve the objectives of the subject, the following type of activities will be used:

1. Theoretical lectures where professors will develop the main concepts

The objective of this activity is to present the fundamental notions of the subject, and to facilitate their learning through the analysis of examples, which will emphasise both intuitive aspects and applications and explanations in the subject 'economic environment'.

2. Practical classes where the resolution of the problems will be discussed

This activity has the purpose to comment and solve the doubts that the students could have during the resolution of the problems so that these can understand and at the same time correct the possible errors committed. The presentation of solutions by students will be enhanced, either orally as a prior step in their discussion, or in written form.

3. Problem solving by students

Each topic will have a list of problems associated, which will have to be solved independently by the students. The objective of this activity is double, since on the one hand it is intended that the student assimilates the theoretical concepts and work tools exposed in class and, on the other, that acquires the necessary skills to solve exercises and problems.

4. Attending office hours

The student will have a few hours where the professors of the subject will be able to help him/her to solve the doubts that are presented to him in the study of the subject and in the resolution of problems. Due to the use of mathematical symbols that this activity implies, the tutorials will be developed in person.

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			
Problem sets resolution	18	0.72	2, 5, 6, 1, 7, 4, 8, 3, 9, 11, 10
Theory lectures	32	1.28	2, 5, 6, 7, 4, 3, 9, 11
Type: Supervised			
Follow-up of homework	3	0.12	2, 5, 6, 1, 7, 4, 8, 3, 9, 11, 10
Tutorships	2	0.08	2, 5, 6, 1, 7, 4, 8, 3, 9, 11, 10
Type: Autonomous			
Study	88	3.52	2, 5, 6, 1, 7, 4, 8, 3, 9, 11, 10

Evaluation

The evaluation of the course will be carried out in a continuous way, through partial assessments and a final exam. The type of activities and their weight in the final note is the following:

- Final exam: 50% of the final mark (all the syllabus)
- Mid-term exam: 25% of the final mark
- Continuous assessment activities: 25% of the final mark

The final grade will be the weighted average of the activities. The minimum note policy for any activity is not set.

If applying the above mentioned % the qualification of the student is 5 or higher, the course is considered as passed and this will not be subject to a new evaluation. In the case of a grade less than 3.5, the student will have to course it again in the following year. For those students who have obtained a grade that is equal to or greater than 3.5 and less than 5, there will be a re-take exam. The professors of the subject will decide the modality of this re-take exam. This re-take exam is scheduled in the last week of the semester. The re-take exam grade will be qualitative and will only have two possible options: PASS or NO PASS. If the student obtains a PASS grade, it is considered that they have passed the subject with a maximum numerical grade equal to 5. If the student obtains a NO PASS score, they do not exceed the subject and the final grade will be equal to the one obtained before the re-take exam.

A student is considered to be "Not Evaluated" in the subject as long as he has not participated in any of the assessment activities. Therefore, it is considered that a student who does some component of continuous modality can no longer opt for a "Not Evaluated".

Those students who attend the subject for the second, third or fourth time have the option to follow the continuous modality or to present themselves directly to the final exam, which will mean that it will count 100% of the final grade.

Attending to one or more of the continuous modality activities will count as that the student follows this modality and will no longer opt for the possibility of not being evaluated of the subject as 'not evaluated'.

The mid-term and final exams will be common to all the bachelor grades of the Faculty and will be carried out the same day and the same time (the part will be divided between groups in the morning and in the afternoon).

Students must be examined in the classroom assigned to the group where they are enrolled. Doing the exam in the classroom assigned to another group may entail the complete loss of the grade as not-attended.

Calendar of evaluation activities

The dates of the evaluation activities (midterm exams, exercises in the classroom, assignments, ...) will be announced well in advance during the semester.

The date of the final exam is scheduled in the assessment calendar of the Faculty.

"The dates of evaluation activities cannot be modified, unless there is an exceptional and duly justified reason why an evaluation activity cannot be carried out. In this case, the degree coordinator will contact both the teaching staff and the affected student, and a new date will be scheduled within the same academic period to make up for the missed evaluation activity." **Section 1 of Article 115. Calendar of evaluation activities (Academic Regulations UAB).** Students of the Faculty of Economics and Business, who in accordance with the previous paragraph need to change an evaluation activity date must process the request by filling out an **Application for exams' reschedule**

https://eformularis.uab.cat/group/deganat_feie/application-for-exams-reschedule

Grade revision process

After all grading activities have ended, students will be informed of the date and way in which the course grades will be published. Students will be also be informed of the procedure, place, date and time of grade revision following University regulations.

Retake Process

"To be eligible to participate in the retake process, it is required for students to have been previously been evaluated for at least two thirds of the total evaluation activities of the subject." **Section 3 of Article 112 ter. The recovery (UAB Academic Regulations).** Additionally, it is required that the student to have achieved an average grade of the subject between 3.5 and 4.9.

The date of the retake exam will be posted in the calendar of evaluation activities of the Faculty. Students who take this exam and pass, will get a grade of 5 for the subject. If the student does not pass the retake, the grade will remain unchanged, and hence, student will fail the course.

Irregularities in evaluation activities

In spite of other disciplinary measures deemed appropriate, and in accordance with current academic regulations, *"in the case that the student makes any irregularity that could lead to a significant variation in the grade of an evaluation activity, it will be graded with a 0, regardless of the disciplinary process that can be instructed. In case of various irregularities occur in the evaluation of the same subject, the final grade of this subject will be 0".* **Section 10 of Article 116. Results of the evaluation. (UABAcademic Regulations).**

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Activities to be delivered	25%	4	0.16	2, 5, 6, 7, 4, 8, 3, 9, 11, 10
Final exam	50%	2	0.08	2, 5, 6, 1, 7, 4, 3, 9, 11
Mid-term exam	25%	1	0.04	2, 5, 6, 1, 7, 4, 3, 9, 11

Bibliography

Main textbooks:

- Sydsaeter, K. and P.J. Hammond, 1995, Mathematics for Economic Analysis. London, Prentice Hall.
- Sydsaeter, K. and P.J. Hammond, 2012, Essential Mathematics for Economic Analysis. London, Pearson.

Complementary textbooks:

- Alejandro, F., F. Llerena, and C. Vilella, 1995, Problemes de matemàtiques per a econòmiques i empresarials, Editorial Media.
- Chiang, A.C., 2005, Fundamental Methods of Mathematical Economics, McGraw-Hill. Demidovich, B.P., 1976, Problems in Mathematical Analysis, Moscow, MIR Publishers.
- Hoffmann, L.D., G.L. Bradley, G., and K.H. Rosen, 2005, Applied Calculus for Business, Economics, and the Social and Life Sciences, McGraw-Hill.
- Larson, R., R. Hostetler, and B. Edwards, 1994, Calculus with Analytic Geometry, Lexington, D.C. Heath.