UAB
Universitat Autònoma de Barcelona

Calculus 1

2026/2027

Code: 104844
Credits: 6

Degree programme	Type	Course
Applied Statistics	FB	1

Contact lecturer

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Teaching staff

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Group languages

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

Prerequisites

This course is basic in nature and aims to familiarize students with the key concepts of the calculus of real functions of one variable and their use in problem-solving.

A solid knowledge of mathematics corresponding to secondary education is necessary, with special emphasis on the topics covered in high school.

Those who have not taken any mathematics courses recently will need to make an effort to catch up with the necessary material for this course, such as the basics of algebraic manipulation (calculations with fractions, polynomials, powers, trigonometric functions, etc.), as well as the basic study of functions (derivatives and graphical representation).

Objectives

Familiarize students with the key concepts of the calculus of real functions of one variable: functions, limits, continuity, differentiation, integration, and power series, etc.

Throughout the course, students should acquire skills in practical calculations of operations with powers, logarithms, trigonometric functions, derivatives, limits, the calculation of antiderivatives, and power series. Beyond the mechanics of calculation, it is also very important for students to identify when and which of the tools and concepts of calculus they have studied apply to the resolution of specific problems they encounter, and, in particular, to the theory of probability and statistics inherent to the degree.

Learning outcomes

- KM01 (Recognise the language and basic tools of calculus in one and various variables.) Recognise the

language and basic tools of calculus in one and various variables.

- SM01 (Apply the concepts studied to calculate the extreme points of functions and moments of random variable distributions.) Apply the concepts studied to calculate the extreme points of functions and moments of random variable distributions.
- SM03 (Solve, using numerical methods, optimisation problems, linear algebra and analysis in general that appear in science and, especially, in statistics.) Solve, using numerical methods, optimisation problems, linear algebra and analysis in general that appear in science and, especially, in statistics.
- SM04 (Resolve problems associated with the extreme points of functions of one and several variables, and the calculation of moments.) Resolve problems associated with the extreme points of functions of one and several variables, and the calculation of moments.

Contents

1. Real numbers

1.1 Numbers. Inequalities. Absolut value. Intervals.

2. Differential Calculus

2.1 Functions of a real variable. Limits and continuity.
2.2 Exponential, logarithmic and trigonometric functions.
2.3 Derivative of a function. Derivation rules. Derivation of elementary functions.
2.4 Mean Value Theorem. Increasing and decreasing functions. Absolute and relative extrema. Optimization.
2.5 Higher order derivatives. Taylor's formula.

3. Integral Calculus

3.1 Definite integral. Fundamental theorems of integral calculus.
3.2 Fundamental theorems of integral calculus.
3.3 Calculus of primitives.
3.4 Aplications
3.5 Improper integrals

4. Series and power series

4.1 Numerical series and convergence.
4.2 Series of positive terms and convergence criteria.
4.3 Absolutely convergent series.

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Problems classes	24	0.96	
Tutoring	18	0.72	
Theoretical classes	24	0.96	
Personal study	66	2.64	

The learning process for the subject should essentially be based on the personal work of the students. Therefore, we emphasize the importance of the students' participation (and attendance) in the maximum number of classes where theoretical concepts are developed, problems are discussed and solved, practical exercises are carried out, and tutorials are held. However, (as in many other areas of human activity: music, sports...), merely observing how the teacher solves certain problems has very limited value. Knowledge is only achieved when one works autonomously and critically.

Directed activities are distributed according to the following types:

Development of concepts, techniques, and examples (theory): These are classes in which the teacher introduces the basic concepts and techniques related to the subject matter, showing examples of their application. It is recommended to complete the study using the books from the bibliography. On the \"Campus Virtual/Moodle\", the students will find helpful material for the course.

Problem-solving (problems): Problems from the lists previously posted on the CV will be treated. For the problem-solving sessions, it will be useful for students to have thought about and reflected on the problems before the class time. Thinking about and solving problems is considered essential for satisfactorily assimilating the concepts and results of the subject.

Practical use of acquired knowledge: One of the basic objectives is for students to become familiar with the process of translating real problems into mathematical language, know how to interpret them, and be able to use the concepts and techniques from the course to carry out a satisfactory resolution.

It is worth insisting that the best work methodology is based on constant work. If this is not done, classes become tedious and unproductive, as mathematics is based on building new knowledge on top of previously mastered concepts, in a pyramidal manner. This individual and autonomous study must always be linked to the practice of written mathematical communication. It is necessary to know how to write correctly on paper the ideas we have in mind about solving a particular problem.

The \"Campus Virtual\" will be used as a means of communication. Course notes, exercise lists, and all teaching materials used will be posted on the CV.

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
Mid term exam	40	4	0.16	KM01, SM01, SM03, SM04
Recovery exam	80	4	0.16	KM01, SM01, SM03, SM04

Second mid term exam	40	4	0.16	KM01, SM01, SM03, SM04
Problem delivery	20	6	0.24	KM01, SM01, SM03, SM04

See de catalan version

Bibliography

1. Larson-Hostetler-Edwards, Cálculo I, Ed. Pirámide. 2002.
2. S. Salas, E. Hill, G. Etgen, Calculus volum I, Ed. Reverté, Barcelona 2002
3. J. Rogawski. Cálculo (una variable). Ed. Reverté. 2008.

Software

During the course there will be no sessions with specific software but it is highly recommended to use the software tools available from other courses to work the concepts of the course.

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	1	Catalan	first semester	afternoon
(PAUL) Classroom practices	1	Spanish	first semester	afternoon
(PAUL) Classroom practices	2	Catalan	first semester	afternoon