UAB
Universitat Autònoma de Barcelona

Calculus

2026/2027

Code: 108222
Credits: 6

Degree programme	Type	Course
Aeronautical Management	FB	1

Contact lecturer

Name : Ana María Abad Muñoz
Email : anamaria.abad@uab.cat

Group languages

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

Prerequisites

This course has no specific prerequisites and should not present particular difficulty for those who have completed the scientific track of upper secondary education and passed the university entrance exams. However, experience shows that people often enroll who have not taken mathematics at that level, or who studied it many years ago and now have very limited mathematical knowledge. These students should be aware of this difficulty.

In particular, they should have no doubts about the following topics:

1. Calculations with rational numbers, fractions, percentages, and real numbers.
2. Algebraic expressions involving variables and numbers, including simplification.
3. Solving first- and second-degree polynomial equations. Polynomial long division.
4. Clear understanding of trigonometry and equations of lines in the plane.
5. Graphical representation of basic functions (polynomial, exponential, and rational).
6. Differentiation and integration.

Objectives

The subjects of Calculus, Statistics, and Algebra form a block within the Degree Program that is designed to provide students with the mathematical concepts and tools necessary to understand, develop, and evaluate the management processes of the various systems found in the aeronautical sector. Likewise, the aim is to provide students with a command of basic mathematical language so that they can later tackle the reading of texts they may need, both in academic and professional contexts.

In this course, students are expected to become familiar with functions of one variable and acquire an introductory understanding of functions of two or three real variables. In addition, several transversal objectives should be achieved, primarily the development of the ability to translate real-life problems into mathematical language, formulate them appropriately, and solve them correctly.

Learning outcomes

- KM01 (Identify the mathematical concepts necessary in the processes of systems in the aeronautical sector.) Identify the mathematical concepts necessary in the processes of systems in the aeronautical sector.
- SM01 (Use basic mathematical language to interpret those texts that use it to convey ideas and

methods.) Use basic mathematical language to interpret those texts that use it to convey ideas and methods.
- SM03 (Perform derivatives and integrals of mathematical functions.) Perform derivatives and integrals of mathematical functions.

Contents

1. Functions of One Real Variable

1.1 Definition of a function.

1.2 Limits of functions. Continuity. Bolzano's Theorem.

1.3 Polynomial functions. Exponential and logarithmic functions. Trigonometric functions.

1.4 Differentiation of functions. Algebraic rules of differentiation. Chain rule.

1.5 Growth of functions. Relative and absolute extrema. Computation of limits using differentiation techniques.

1.6 Concavity and convexity of functions.

1.7 Graphical representation of functions.

2. Integral Calculus

2.1 Definite integral.

2.2 Fundamental Theorem of Calculus. Barrow's Theorem.

2.3 Computation of antiderivatives.

2.4 Applications of definite integrals to the calculation of areas, volumes, and lengths.

3. Functions of Several Real Variables

3.1 Functions of several variables. Level sets.

3.2 Directional and partial derivatives. Gradient. Tangent plane to a surface.

3.3 Unconstrained extrema of functions of two real variables.

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Seminars	5	0.2	KM01, SM01, SM03
Study of theoretical concepts	35	1.4	KM01, SM01, SM03
Problem solving	46	1.84	KM01, SM01, SM03
Problem classes	15	0.6	KM01, SM01, SM03
Theoretical lectures	30	1.2	KM01, SM01, SM03
Test preparation	12	0.48	KM01, SM01, SM03

This is a semester-long course. Each week, there are two hours of lectures and one hour of problem-solving sessions. Students are divided into two working groups to attend the problem-solving classes. In addition, two

seminars will be held, totaling 5 hours.

The specific language and content of mathematics courses can make individual study challenging for students; therefore, it is essential to make the most of both the theoretical explanations and the practical classes.

The lectures are intended to introduce the basic concepts, clarify ideas, and provide the tools needed to successfully tackle problem solving. These lectures will continuously include examples and exercises to help illustrate the theoretical concepts.

During the problem-solving classes, students will work on exercises from lists provided by the course instructors. It is highly recommended that students read and attempt the proposed exercises beforehand. This will make participation in the problem sessions and the assimilation of course content more effective. Since only one hour per week is allocated to problem-solving classes, the most representative problems will be presented in class, serving as models for solving the remaining exercises.

Regarding the seminars, two seminar sessions are planned, totaling 5 hours. Questions and problems will be assigned for students to solve and will be assessed. Optionally, students may work and submit their solutions in groups of up to three people.

The Moodle classroom within the Virtual Campus will be of vital importance for following the course. It will be the primary communication channel between students and instructors. Students are encouraged to check the Virtual Campus regularly.

The instructors' office hours will be announced.

Note: Fifteen minutes of a class session, within the timetable established by the School or Degree Program, will be reserved for students to complete the surveys evaluating both the teaching performance of the instructors and the course itself.

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
P2 - Midterm exam at the end of the first term	70	2	0.08	KM01, SM01, SM03
S2 - Seminar	15	2	0.08	KM01, SM01, SM03
S1 - Seminar	15	3	0.12	KM01, SM01, SM03

Continuous Assessment Activities

a) Assessment Process and Scheduled Activities

- Activity S1: consists of a first seminar at the beginning of the first semester, comprising a series of assessable problems that may be submitted in working groups. It accounts for 15% of the final grade.
- Activity S2: consists of a second seminar, comprising a series of assessable problems that may be submitted in working groups, held midway through the first semester. It accounts for 15% of the final grade.
- Activity P: consists of an exam at the end of the first semester, accounting for 70% of the final grade.

Each of these assessable activities will receive a grade between 0 and 10, denoted respectively as S1, S2, and P.

To pass the course through continuous assessment, students must obtain a grade of at least 2 in exam P.

The continuous assessment grade will be calculated as follows:

$QC = 0.15 \cdot S1 + 0.15 \cdot S2 + 0.70 \cdot P$

The continuous assessment is considered passed if QC is equal to or greater than 5.

b) Scheduling of Assessment Activities

The schedule of assessment activities will be published through the Virtual Campus.

Some exam dates and classroom locations will also be available on the School of Engineering website, in the examinations section.

c) Resit Process

A resit examination (R) covering the entire syllabus of the first semester will be scheduled for students who do not pass through continuous assessment.

Students are not required to meet any specific conditions in order to sit the resit examination.

The final grade will be calculated using the following formula:

$QF = \max \{QC, R\}$

Students who have obtained a QC grade of 5 or higher and wish to improve their grade may also take the resit examination under the same conditions. The same formula (QF) will apply to these students.

d) Procedure for Reviewing Grades

For each assessment activity, a place, date, and time for grade review will be announced, during which students may review the activity with the teaching staff or carry out the review online.

Within this framework, students may submit appeals regarding the grade awarded for the activity, which will be evaluated by the instructors responsible for the course. If a student does not attend the review session, the activity will not be reviewed at a later date.

The review of the final grade follows the same procedure as that of continuous assessment.

e) Grades

Honours Distinction (Matrícula de Honor). The awarding of an Honours Distinction is at the discretion of the instructors responsible for the course. UAB regulations state that this distinction may only be awarded to students who have obtained a final grade of 9.00 or higher. Up to 5% of the total number of enrolled students may receive this distinction.

A student will be considered Not Assessable (NA) if they do not sit either the first partial exam or the second partial exam.

f) Student Misconduct, Cheating, and Plagiarism

In recent years, a significant increase in cheating during written assessments has been observed. Although it is difficult to determine exactly how it is carried out, it is often noticeable in mathematics-related subjects. The School requires the inclusion of the following statement, which will be strictly enforced this academic year:

Without prejudice to any other disciplinary measures deemed appropriate, any irregularities committed by a student that may lead to an alteration of the grade awarded for an assessment activity will be graded as zero. Therefore, cheating, plagiarism, deception, allowing others to copy, etc., whether partially or entirely in any assessment activity, will result in that activity being failed with a grade of zero. The implications of such a grade on the possibility of passing the course will be assessed by the teaching team after consulting the individuals involved.

If the teaching team detects a student cheating in any assessable activity, the student will automatically fail the course and will be required to take the resit examination in order to pass the subject.

In this course, the use of Artificial Intelligence (AI) technologies is not permitted at any stage. Any work containing AI-generated content will be considered a breach of academic integrity and may result in a partial or total grade penalty for the activity, or more severe sanctions in serious cases.

Students who use a mobile phone during an in-person assessment, whether individually or through a member of their work group, will lose the right to continuous assessment and must take the resit examination. In this case, they will be required to sit exam R, following the criteria specified in section c) Resit Process of this course guide.

h) Assessment of Repeat Students

Students retaking the course must follow the general continuous assessment procedure described in the previous sections.

i) Single Assessment

This course does not provide a single-assessment option.

If a student is unable to attend an assessment activity for justified reasons, arrangements will be made for them to complete it at another time.

Bibliography

The course syllabus is covered in many textbooks. Some examples include:

LARSON, HOSTETLER, EDWARDS; *Calculus*, Vols. 1 and 2. Pirámide, 2002.

THOMAS, FINNEY; *Calculus with Analytic Geometry*, Vols. 1 and 2. Addison Wesley Iberoamericana, 1987.

SALAS, HILLE; *Calculus*, Vols. 1 and 2. Reverté, 1995.

All of these books, as well as many other useful reference materials, can be found in the Library of the School of Engineering in Sabadell. Students are encouraged to visit the library and make regular use of its resources.

Software

The course schedule does not include any computer laboratory sessions; therefore, no formal study of software applications will be carried out. Nevertheless, the use of mathematical computation and symbolic manipulation programs such as Maxima and Wolfram Alpha will be recommended, as they can be very useful for students.

Both of the programs mentioned are freely available to use, although the latter also offers a paid version that is relatively inexpensive.

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	11	Catalan	first semester	afternoon
(PAUL) Classroom practices	11	Catalan	first semester	afternoon
(PAUL) Classroom practices	12	Catalan	first semester	afternoon
(SEM) Seminars	31	Catalan	first semester	afternoon
(SEM) Seminars	32	Catalan	first semester	afternoon
(SEM) Seminars	33	Catalan	first semester	afternoon
(SEM) Seminars	34	Catalan	first semester	afternoon