Calculus

Code: 103815
ECTS Credits: 9

2025/2026

Degree	Type	Year
Aeronautical Management	FB	1

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Teaching groups languages

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

Prerequisites

This subject has no specific prerequisites and should not be particularly difficult for people who have completed the Scientific Baccalaureate and have passed the selection tests. But experience shows us that people often enroll who have not taken the high school mathematics training or may have taken it many years ago and their knowledge of mathematics is very poor, many times they come from the High School of Social Sciences. These people must be aware of their problem and act. For example, they can review their high school books, or take a private class, comment on it to the teacher, etc.

In particular, there should be no doubt about these points.

1. Calculation with rational numbers, fractions, both percent and real numbers.

2. Calculation of algebraic expressions with letters and numbers, simplifications.

3. Solving first and second degree polynomial equations. Integer division of polynomials.

4. Clear notions of trigonometry and equations of lines on the plane.

5. Graphic representation of elementary functions (polynomial, exponential and rational).

6. Calculus of derivatives and integration.

Objectives and Contextualisation

The subjects of Calculus, Statistics and Linear Algebra form a block that is designed within the Study Plan to provide the student with the mathematical concepts and tools necessary to understand, develop and evaluate the management processes of the different systems present in the sector aeronautical Likewise, the aim is to provide the student with mastery of the basic mathematical language in order to subsequently be able to face the reading of texts that may be needed, both at an academic and professional level.

In this subject, the student must become familiar with the functions of one variable and have some initial notions of functions of two or three real variables. Some cross-cutting objectives must also be achieved, mainly developing the ability to translate real-life problems into mathematical language, pose them and solve them correctly.

Competences

- Personal attitude.
- Personal work habits.
- Thinking skills.
- Use knowledge of the fundamental principles of mathematics, economics, information technologies and psychology of organisations and work to understand, develop and evaluate the management processes of the different systems in the aeronautical sector.

Learning Outcomes

1. Critically assess the work done.
2. Derive functions and perceive derivatives as reasons for change.
3. Develop critical thought and reasoning.
4. Develop curiosity and creativity.
5. Develop independent learning strategies.
6. Develop scientific thinking skills.
7. Develop systemic thinking.
8. Develop the ability to analyse, synthesise and plan ahead.
9. Draw and interpret graphs of functions.
10. Formulate and solve problems that require solutions to differential equations.
11. Manage time and available resources. Work in an organised manner.
12. Optimise functions of one or several variables.
13. Use basic mathematical language to understand the texts that use it.
14. Work independently.

Content

1. Functions of a real variable

1.1 Real numbers, intervals, equations, inequalities. Functions, composition of functions and graphs.

1.2 Limits of functions. Continuity Bolzano's theorem. Existence theorem of absolute extremes.

1.3 Polynomial functions. Exponentials and logarithms. Trigonometric functions.

1.4 Derivation of functions. Algebraic derivation rules. Chain rule. Derivative of the inverse.

1.5 Mean value theorem. Growth of functions. Relative and absolute extremes. Calculation of limits with derivation techniques.

1.6 Concavity and convexity of functions. Graphical representation of functions.

1.7 Optimization problems.

2 Integral calculus

2.1 Defined integral. Properties of integrals.

2.2 Fundamental Theorem of the Integral Calculus. Barrow's theorem.

2.3 Calculation of primitives.

2.4 Applications of integrals defined for the calculation of areas, volumes, lengths.

2.5 Notion of differential equation. Explicit solution of some differential equations of first order.

2.6 Some examples of applications of differential equations.

3. Functions of several real variables

3.1 Vectors in the plane and in space. coordinates

3.2 Scalar product. Distances Equations of lines and planes.

3.3 Functions of several variables. level sets

3.4 Directional and partial derivatives. gradient Chain rule. Tangent plane to a surface.

3.5 Free extremes of functions of two or three real variables.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Classes of problems	22	0.88	1, 2, 6, 7, 5, 8, 4, 3, 9, 13, 11, 12, 10, 14
Classes of theory	45	1.8	2, 6, 7, 8, 3, 9, 13, 12, 10
Seminars	6	0.24	1, 2, 6, 7, 5, 8, 4, 3, 9, 13, 11, 12, 10, 14
Type: Autonomous			
Learning the basic concepts	50	2	1, 2, 6, 7, 5, 8, 4, 3, 9, 11, 12, 10, 14
Preparation to be evaluated	23	0.92	1, 2, 6, 7, 5, 8, 4, 3, 9, 13, 11, 12, 10, 14
Solving problems	67	2.68	1, 2, 6, 7, 5, 8, 4, 3, 9, 13, 11, 12, 10, 14

It is an annual subject of 9 credits. In the first semester, there are two hours of theory, one of problems each week and only one seminar. In the second semester there is one weekly hour of theory, one hour of problems and two seminars.

The language and content of the mathematics subjects can make it difficult for the student to work individually, so it is essential to make the most of the theoretical explanations and practical classes.

The theory classes will serve to introduce the basic concepts, clarify ideas and provide the tools to successfully tackle problem solving. Theory classes will constantly include examples and problems to help illustrate theoretical concepts. In the problem classes, the exercises will be done from the lists provided by the teachers of the subject. It is highly recommended that the student has previously read and worked through the exercises proposed in the lists. In this way, the participation in the problem classes and the assimilation of the contents will be more profitable. Having only one hour of problems per week, the most representative problems will be shown in the classroom to serve as a model for others.

As for the seminars, three seminar sessions are planned. In the first hour of each session, questions and problems will be proposed that the students will have to solve and they will be able to work in groups. In the second hour, a sheet with similar questions will be given to the teacher and will be evaluated. They can do it in work groups of three people.

The Moodle classroom within the Virtual Campus will be of vital importance for monitoring the course. This will be the most important channel of communication between students and teachers. It will be important to consultthe Virtual Campus frequently.

The faculty's office hours will be made public. It is highly recommended that students make use of these office hours.

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

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Partial examination of the content of first semester	35	3	0.12	1, 2, 6, 7, 5, 8, 4, 3, 9, 13, 11, 12, 10, 14
Partial examination of the content of second semester	35	3	0.12	1, 2, 6, 7, 5, 8, 4, 3, 9, 13, 11, 12, 10, 14
Seminars	30	6	0.24	1, 2, 6, 7, 5, 8, 4, 3, 9, 11, 12, 10

a) Scheduled evaluation process and activities

Activity P1, consisting of a partial exam at the end of the first semester, with a weight of 35% on the final grade.

Activity P2, consisting of a partial exam at the end of the second semester, with a weight of 35% on the final grade.

Activity S1, attendance at the first seminar and delivery of the work completed during in the middle of the first semester, 10% on the final grade.

Activity S2, attendance at the second seminar and delivery of the work completed during the fisrt of the second semester, 10% on the final grade.

Activity S3, attendance at the third seminar and delivery of the work completed during in the middle of the second semester, 10% on the final grade.

Each of these evaluable activities will receive a rating between 0 and 10 and will be denoted by P1, P2, S1, S2, S3 respectively.

In order to pass the subject, through continuous assessment, you must have a minimum {P1,P2} greater than or equal to 1.

The grade of the continuous assessment will be:

QC = 0.35* P1 + 0.10*S1 + 0.10*S2 + + 0.10*S3 + 0.35*P2.

It should be noted that activities S1, S2, S3 are not recoverable and their dates are fixed at the beginning and will be immovable. In the event that a student is unable to attend the session called, with a documented reason, a solution to the problem that has been raised will be sought on an individual basis.

The continued evaluation is approved if QC is equal to or greater than 5.

b) Evaluation activity schedule

The calendar of assessment activities will be made public through the Virtual Campus and the dates and classrooms of the two partial exams on the website of the School of Engineering, in the exams section.

c) Recovery process

A make-up exam consisting of two parts will be scheduled:

- R1 will be the grade for the recovery of activity P1, on the syllabus of the first semester

- R2 will be the grade for the recovery of the P2 activity, on the syllabus of the second semester

The student does not have to meet any condition to be able to take the recovery test.

Students who do not pass the continuous assessment can choose whether to present themselves in part R1 of the recovery or in part R2 or both.

The final grade will be obtained with the following formula:

QF = 0.35*max{P1,R1} + 0.10 *S1 + 0.10 *S2 + 0.10 *S3 + 0.35*max{P2, R2} +0.10*C2.

Students who have obtained a QC qualification higher than or equal to 5 and wish to improve it may also present themselves for recovery, under the same conditions. For these students, the same QF formula will be applied.

d) Qualification review procedure

For each assessment activity, a review place, date and time will be indicated in which the student can review the activity with the teacher. In this context, claims can be made about the grade of the activity, which will be evaluated by the teacher responsible for the subject. If the student does not appear for this review, this activity will not be reviewed later.

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

e) Qualifications

Honor matriculations. Awarding an honors matriculation qualification is the decision of the teaching staff responsible for the subject. UAB regulations indicate that MH can only be granted to students who have obtained a final grade equal to or higher than 9.00. Up to 5% of MH of the total number of enrolled students can be awarded.

A student will be considered non-evaluable (NA) if he/she has not taken either the first partial exam or the second partial exam.

f) Irregularities by the student, copying and plagiarism

In recent years there has been a large increase in copying in written tests. It is difficult to know how they do it, but in the discipline of mathematics it is very noticeable. Having passed a subject thanks to copying isan act of contempt towards all colleagues, and represents a fraud from which the most harmed in the future will be the student himself. On behalf of the School, this text is put in place, which will be applied this year without any changes. Without prejudice to other disciplinary measures deemed appropriate, irregularities committed by the student that could lead to a change in the grade of an assessment act will be graded with a zero. Therefore, copying, plagiarism, cheating, allowing copying, etc., partially or fully in any of the assessment activities will involve failing it with a zero. The implications that this assessment has on the possibility of passing the subject will be assessed by the teaching team having spoken with the people involved.

In this subject, the use of Artificial Intelligence (AI) technologies is not allowed in any of its phases. Any work that includes fragments generated with AI will be considered a lack of academic honesty and may lead to a partial or total penalty in the grade of the activity, or greater sanctions in serious cases.

h) Evaluation of repeat students

The repeating student must follow the general continuous assessment procedure specified in the previous points. Students for whom this is their last call must notify the theory teacher at the beginning of the course.

f) Single evaluation

This subject does not provide for a single assessment system. The teaching committee of the degree already approved that there would be no single assessment in this subject. It was emphasized that if a student has not been able to come to an assessment test for justified reasons, it will be made easier for him to take it at another time.

Bibliography

The syllabus of the subject is covered in many books. As an example:

• LARSON, HOSTETLER, EDWARDS; I calculate Flight. 1.2. Pyramid. 2002.

• THOMAS, FINNEY; Calculation with Analytical Geometry. Flight. 1, 2. Addison Wesley Iberoamericana. 1987

• ROOMS, HILLE; Calculus, Vol. 1.2. reverted 1995

You will find all these books and many other helpful ones in the Sabadell School Library. It is recommended that you visit this Library and make regular use of its holdings.

In addition, the class summaries that will be published, although they do not replace the books, will be of great use to you if you work and study them.

Software

There are no computer internship classes planned in the course, so no study of computer programs will be done. Despite this, it will be recommended to use mathematical manipulation programs such as Maxima or Wolfram Alpha, which can be very useful. Both of these programs are free to use, although the latter has a paid version that is not expensive.

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	11	Catalan	annual	afternoon
(PAUL) Classroom practices	12	Catalan	annual	afternoon
(SEM) Seminars	31	Catalan	annual	afternoon
(SEM) Seminars	32	Catalan	annual	afternoon
(SEM) Seminars	33	Catalan	annual	afternoon
(SEM) Seminars	34	Catalan	annual	afternoon
(TE) Theory	11	Catalan	annual	afternoon