Universitat Autònoma de Barcelona

2023/2024

Calculus

Code: 103815
ECTS Credits: 9

Degree	Type	Year	Semester
2501233 Aeronautical Management	FB	1	A

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.

Teachers

Joan Josep Carmona Domènech

External teachers

Anna Maria Abat

Marti Almor

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 completed high school mathematics training or have completed it many years ago and their knowledge of mathematics is very poor. These people find it very difficult to follow the course. We have also noticed that as a result of the COVID pandemic its level has dropped. They are people who can do a derivative of a rational function well, but then they simplify diagonally and from there nothing they do next makes sense. Or apply that the square root of a difference is the difference of square roots and the whole problem loses its meaning. 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, ask a colleague for help, etc.

In particular, there should be no doubts 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.

Objectives and Contextualisation

The subjects of Calculus, Statistics and Linear Algebra form a block that is designed within the Curriculum to provide students with the concepts and mathematical tools necessary to understand, develop and evaluate the management processes of the different systems present in the sector. aeronautical. The aim is also to provide students with a mastery of basic mathematical language so that they can later tackle the reading of texts that they may need, both academically and professionally.

In this subject it is necessary for the student to become familiar with the functions of a variable and to have some initial notions of functions of two or three real variables. Some cross-curricular goals 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, inequations. Functions, composition of functions and graphics.

1.2 Limits of functions. Continuity. Bolzano's theorem. Theorem of existence of absolut extrems.

1.3 Polynomial functions. Exponential and logarithms. Trigonometric functions

1.4 Derivation of functions. Algebraic rules of derivation. Rule of the chain. Derived of the inverse function.

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 Integral defined. Properties of the integrals.

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

2.3 Calculation of primitives.

2.4 Applications of the defined integrals.

2.5 Notion of differential equation. Explicit resolution of some first-order differential equations.

2.6 Some applications of differential equations.

3. Functions of several real variables

3.1 Plane and space vectors. Coordinates

3.2 Scalar product.. Distances.

3.3 Functions of several variables. Level sets.

3.4 Directional and partial derivatives. Gradient Rule of the chain. Plan tangent to a surface.

3.5 Free extremes of functions of two real variables

Methodology

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

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, practical classes and tutoring hours.

The theoretical classes will be presented in the traditional way, i.e. blackboard and chalk. 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 of two. 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 two people.

The Moodle classroom within the Virtual Campus will be of vital importance during the course. This will be the most important channel of communication between students and teachers. A lot of course material will be posted there, for exampleexams from previous years or teaching materials from other teachers. Since the pandemic, we are trying to put a summary of the theory classes, which will be updated week by week. It will be important to consult the Virtual Campus material regularly.

The teacher's tutoring schedule will be made public. It is highly recommended that students make use of these tutoring hours, if the access conditions allow, to resolve any doubts that arise

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			
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

Assessment

a) Scheduled evaluation process and activities

Activity P1, consisting of a partial exam at the end of the first semester, v

Activity P2, consisting of a partial exam at the end of the second semeste

Activity C1, consisting of a problem test in the middle of the first semeste

Activity C2, consisting of a problem test in the middle of the second seme

Activity S, attendance at the seminars and delivery of the work completed

Each of these evaluable activities will receive a rating between 0 and 10

In order to pass the subject, through continuous assessment, you must h

The grade of the continuous assessment will be:

QC = 0.40* P1+ 0.10*C1 + 0.30*P2 +0.10 *C2 + 0.04*S1+0.03*S2+0.03*

It should be noted that activities C1, C2 and S are not recoverable and th

b) Evaluation activity schedule

The calendar of assessment activities will be made public through the Vi

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 term

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

In order to be able to take the recovery test, the student must fulfill two conditions. The first to have appeared in both partials and have a minimum {P1,P2} greater than or equal to 0.5 and the second that the QC qualification must be greater than or equal to 1.

Students who, fulfilling the two previous conditions, have obtained a grade lower than 1 in one of the P1 or P2 activities, will have to make up R1 or R2 as the case may be. Students who, having obtained a grade equal to or higher than 1 in activities P1 and P2, 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 = 0.40*max{P1,R1} + 0.10 *C1 + 0.30*max{P2, R2} +0.10*C2 + 0.04*S1+0.03*S2+0, 03*S3

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.

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

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.

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 year.

i) Single evaluation

As the subject is annual and has 7 assessment tests, the teaching committee of the degree agreed that the subject would not have a single assessment. It was emphasized that if a student has not been able to come to an assessment test for a justified reason, it will be made easier for him to take it at another time.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Partial examination of the content of first semester	40	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	30	3	0.12	1, 2, 6, 7, 5, 8, 4, 3, 9, 13, 11, 12, 10, 14
Seminars	10	3	0.12	1, 2, 6, 7, 5, 8, 4, 3, 9, 11, 12, 10
Solving problems	20	3	0.12	1, 2, 6, 7, 5, 8, 4, 3, 9, 13, 11, 12, 10, 14

Bibliography

The program of the subject is covered in many books. To sample example:

- LARSON, HOSTETLER, EDWARDS ; Cálculo. Vol. 1,2. Piràmide.2002.
- THOMAS, FINNEY; Cálculo con Geometría Analítica. Vol. 1, 2. Addison Wesley Iberoamericana. 1987.
- SALAS, HILLE; Calculus, Vol. 1,2. Reverté. 1995.

- DEMIDOVICH; Problemas y ejercicios de Anàlisis Matemático. Paraninfo. 1993.

All these books and many others similars can be found at the Biblioteca de Sabadell. It is recommended that you visit this library and make regular use of its funds.

We will also put some notes of the course available to students in Campus Virtual system.

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.