Universitat Autònoma de Barcelona

2019/2020

Calculus

Code: 103815
ECTS Credits: 9

Degree	Type	Year	Semester
2501233 Aeronautical Management	FB	1	A

Contact

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Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Teachers

Joan Josep Carmona Domènech
Salvador Comalada Clara
José González Llorente

Prerequisites

This subject does not have specific prerequisites and does not have to present special difficulty for the people who have taken the scientific Baccalaureate and have passed the tests of selectivity. But our experience shows that people who have not been trained in high school or high school mathematics and they are following the course, result that their knowledge in mathematics is very poor. These people find great difficulty in following the course. They are people who can make correctely a derivative of a rational function well, but then simplify diagonally and then the following arguments are wrong. Or apply at the beginning that the square root of a difference is a difference of square roots and the whole problem lost its sense. These people must be aware of their problems and act. For example, they can review the books of the baccalaureate, or do some particular class, comment on the teacher, ask for help from a friend, etc.

In particular about these points they should have no doubts.

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

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

3. Resolution of polynomial equations of first and second degree.

4 Clear concepts of trigonometry and equations of straight lines in the plane.

Objectives and Contextualisation

The subjects of Calculus, Statistics and Linear Algebra form a block that is considered in the Curriculum to provide the student with the concepts and mathematical tools necessary to understand, develop and evaluate the management processes of the different systems present in the sector aeronautics Likewise, it is wanted to provide the student the mastery of the basic mathematical language so that he can face the reading of texts

that he may need, both academic and professional. In this subject, the student must become familiar with the functions of one and several real variables. Some transversal goals must also be achieved, mainly developing the ability to translate real-life problems into mathematical language, raise 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

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 Applications of differential equations.

3. Functions of several real variables

3.1 Plane and space vectors. Coordinates

3.2 Scalar product and vector 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

This is an annual subject. In the first semester there are two hours very week of theory, one of problems and two seminars. In the second semester there is a hour of theory, a hour of problems every week and a seminar.

The own language and the contents of the mathematics subjects can make difficult the individual work of the student, for that reason it is essential to take full advantage of the theoretical explanations, the practical classes and the hours of tutoring.

The theoretical classes will be considered in the traditional way, that is, blackboard and chalk. The theoretical classes will be used to introduce the basic concepts, clarify ideas and provide the tools to successfully tackle problem solving. Theoretical classes will consistently include examples and problems that help illustrate the theoretical concepts. In the classes of problems will be done the exercises of the lists that will provide the teachers of the subject. It is highly recommended that, previously, the student has read and worked out the exercises proposed in the lists. In this way, the participation in the classes of problems and the assimilation of the contents will be more beneficial. By having only one weekly hour of problems, the most representative problems that serve as a model for others will be shown in the classroom.

In fact, the classical distinction "theory - problems" does not respond to the true nature of scientific learning. Theory and problems are inseparable and, although the key to understanding any subject of mathematics is the resolution of problems, therefore the students are encouraged to make an effort, prior to the teaching time in the classroom, in the resolution of the problems.

Three sessions of seminars are planned during the seminars. The first hour of each one will propose questions and problems that the students will have to solve and will be able to work in groups. The second hour will be given a sheet with similar questions that must be given to the teacher and evaluated. They will be able to work in groups of two people.

The student will find in the Moodle class all the necessary teaching material to follow the subject.

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) Processes and scheduled evaluation activities

Activity P1, consisting of a partial exam at the end of the first quadrimester, with a weight of 40% on the final grade.

Activity P2, consisting of a partial exam at the end of the second quadrimester, with a weight of 30% on the final grade.

Activity C1, consisting of a test of problems in the middle of the first quadrimester, with a weight of 10% on the final grade.

Activity C2, consisting of a test of problems in the middle of the second quarter, with a weight of 10% on the final grade.

Activity S, attendance at the seminars and delivery of the work carried out during the three seminars, 10% on the final grade.

Each of these evaluated activities will receive a rating between 0 and 10 and we will denote it by P1, P2, C1, C2, S1, S2, S3 respectively.

In order to be able to pass the subject, by means of the continuous evaluation, it will be necessary to have minimum {P1, P2} greater or equal to 1. The qualification of the continuous evaluation will be:

QC = 0,40* P1+ 0,10*C1 + 0,30*P2 +0,10 *C2 + 0,04*S1+0,03*S2+0,03*S3

Keep in mind that C1, C2 and S activities are not recoverable and their dates are fixed at the beginning and will be unmovable. In case of a student's inability to attend the session convened, with a documented justification, the solution to the problems raised will be individually examined.

b) Programming of evaluation activity

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

c) Recovery process

A recovery exam consisting of two parts will be scheduled:

- R1 will be the qualificationof the recovery of activity P1, on the content the first partial

- R2 will be the rating of the recovery of activity P2, on the content of the second partial

In order to be able to attend the recovery test, the student must meet two conditions. The first one has been submitted to both partials and has a minimum of {P1, P2} greater than or equal to 0.5 and the second that the QC rating must be greater than or equal to 2.

Students who, having fulfilled the two previous conditions, have obtained a grade of less than 1 in any of the activities P1 or P2, they must do the recovery R1 or R2 according to the case. Students who, having obtained a mark equal to or greater than 1 in activities P1 and P2, do not approve of the continuous evaluation can

choose if they are presented in part R1 of the recovery or in part R2 or both. The final grade will be obtained using the following formula:

QF = 0,40*màxim{P1,R1} + 0,10 *C1 + 0,30*màxim{P2, R2} +0,10*C2 + 0,04*S1+0,03*S2+0,03*S3

They may also submit to the recovery, under the same conditions, students who have obtained a QC rating of more than or equal to 5 and want to improve it. For these students the same QF formula will be applied.

d) Procedure for the review of qualifications For each assessment activity, a place, date and time of revision will be indicated in which the student will be able to review the activity with the teacher. In this context, claims can be made about the activity note, which will be evaluated by the professor responsible for the subject. If the student does not submit to this review, this activity will not be reviewed later.

e) Qualifications Honor license plates. Granting an honorific matriculation qualification is a decision of the faculty responsible for the subject. The regulations of the UAB indicate that MH can only be awarded to students who have obtained a final grade of 9.00 or more. It can be granted up to 5% of MH of the total number of students enrolled. A student will be considered non-evaluable (NA) if not submitted to the first partial exam, or to the second partial exam.

f) Irregularities by the student, copy and plagiarism Without prejudice to other disciplinary measures considered appropriate, the irregularities committed by the student that can lead to a variation in the rating of an evaluation act will be qualified with a zero. Therefore, copying, plagiarizing, cheating, copying, etc., partially or totally in any of the assessment activities will involve suspending it with zero. The implications of this assessment in the ability to pass the subject will be assessed by the teaching team having spoken with the people involved.

h) Evaluation of repeating students The repeating student will have to follow the general continuous assessment procedure specified in the previous points. The students for which it is their last oportunity will have to notify the theory professor at the beginning of the course.

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 Library of the School of 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.