

30368 - Calculus

Syllabus Information

Academic year: 2024/25

Subject: 30368 - Calculus

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 581 - Bachelor's Degree in Telecommunications Technology and Services Engineering

ECTS: 6.0

Year: 1

Semester: First semester

Subject type: Basic Education

Module:

1. General information

The purpose of the Calculus subject is to consolidate and expand the basic knowledge of complex numbers and differential and integral calculus of real functions of a real variable, which are essential for the formation of students.

In order to take this subject, it is recommended that the student has mastered the contents of Mathematics I and II, included in the Bachillerato curriculum

<https://educa.aragon.es/documents/20126/521996/164+MATEMATICAS+I+y+II.pdf/1a0ad1d6-aaae-0f7e-4b28-65912137e64d>

and who has achieved the objectives detailed therein.

2. Learning results

- Identify natural, whole, real and complex numbers. Solve problems with inequalities. Calculate with complex numbers (elementary operations, powers and roots). Know the elementary complex functions (exponential, sine, cosine) and operate with them.
- Know elementary real functions and solve problems involving their properties. Calculate limits and analyze the continuity of real functions of a real variable.
- Calculate derivatives and use the mean value theorems, Rolle's theorems and L'Hôpital's rule to solve problems with functions of a real variable. Calculate maxima and minima and intervals of growth and decay of a derivable function.
- Use classical numerical methods for the approximate solution of nonlinear equations.
- Calculate primitives of simple functions, use integration by parts and change of variable. Use the rule of Barrow to solve definite integrals. Derive functions defined by integrals. Identify improper integrals and calculate them in simple cases.
- Analyze the convergence of numerical series, develop elementary power series functions and solve problems with functions defined by power series.
- Use scientific software to solve problems related to the calculation of functions of a real variable with emphasis on numerical methods.

3. Syllabus

- Unit 1. Real and complex numbers.
- Unit 2. Real functions of a real variable: limits and continuity.
- Unit 3. Differential calculus of functions of a real variable.
- Unit 4. Approximate solution of nonlinear equations.
- Unit 5. Integral calculus of functions of a real variable.
- Unit 6. Numerical and power series.

4. Academic activities

Participatory lectures 37 hours

Theoretical contents and results will be presented, complemented with the resolution of practical exercises with active student participation.

Problem solving classes: 11 hours

In small groups, students, guided by the teacher, will solve exercises and problems of the subject.

Laboratory practices: 12 hours

In small groups and using scientific software, students will perform exercises related to numerical methods to approximately solve problems in Calculus (nonlinear equations, numerical derivation, approximation...)

Teaching assignments: 17 hours

Elaboration of the final reports of the laboratory sessions.

Personal study: 70 hours

Assessment tests: 6 hours

5. Assessment system

The subject will be assessed by the global assessment system by means of the following activities:

* **Final exam (80%)** with theoretical-practical questions, exercises and problems corresponding to the topics developed in the lectures and problems.

***Laboratory practice work (20%)**. The requested reports will be assessed. Students who do not take or do not pass these assessment activities will have the possibility of to take an alternative test on the same date as the final exam.

In all exams, activities and assignments, the argumentation, development and correctness of the solutions will be assessed.

6. Sustainable Development Goals

4 - Quality Education

5 - Gender Equality