Universidad Zaragoza

Academic Year/course: 2023/24

30368 - Calculus

Syllabus Information

Academic year: 2023/24
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.

These approaches and objectives are aligned with the Sustainable Development Goals (SDGs) of the 2030 Agenda of United Nations (https://www.un.org/sustainabledevelopment/es/), insofar as mathematics is the tool used by engineers and scientists to model, analyze and optimize a multitude of systems.

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.

Practical classes: 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...)

5. Assessment system

In the first call the student may choose between a continuous assessment or a global assessment.

- Global assessment

The global evaluation consists of an exam with theoretical-practical questions, exercises and problems corresponding to the topics developed in the lectures, problem classes and practices.

- **Continuous assessment**

The continuous assessment consists of:

* An academic paper related to the practices.
* Control activities carried out in the classroom during class hours.
* A final exam with theoretical-practical questions, exercises and problems corresponding to the topics developed in the lectures and problems.

The final grade for the subject will be:

Final rating = NTA*0.25 + NFC*0.3 + NF*0.45
NTA: final grade of academic work out of 10
NFC: final grade of the control activities out of 10
NF: final exam score out of 10
The final exam allows the student to recover the grade of the failed control activities as long as they have completed all of them.

In the second call, the student will perform the global assessment described above.
In all exams, activities and assignments, the argumentation, development and correctness of the solutions will be assessed.