Universidad Zaragoza

Academic Year/course: 2024/25

27054 - Mathematical Analysis I

Syllabus Information

Academic year: 2024/25
Subject: 27054 - Mathematical Analysis I
Faculty / School: 100 - Facultad de Ciencias
Degree: 647 - Degree in Mathematics
ECTS: 7.5
Year: 1
Semester: First semester
Subject type: Basic Education
Module:

1. General information

The object of this course is the differential calculus of real functions of one real variable, with attention to both the practical part and the theory: sequences of real numbers; continuous functions, limits and derivatives.

2. Learning results

- Handle and solve inequalities with real numbers.
- Know the fundamental properties of elementary functions.
- Understand the concept of sequence of real numbers, limit of a sequence and the Bolzano-Weierstrass theorem.
- Handle the rules for the calculation of limits of sequences.
- Understand the ideas of continuous function and limit of a real function of a real variable.
- Handle the rules for the calculation of limits of functions.
- Understand Bolzano's theorem and Weierstrass' theorem about absolute extremes.
- Understand the idea of derivative, its properties, its relation with the increasing or decreasing of a function, its extrema and convexity, the mean value theorems, L'Hôpital's rule and Taylor's formula.
- Understand the importance of rigor in mathematics and the role of proofs and understand the epsilon-delta and similar arguments.

3. Syllabus

1. **Real numbers.** Inequalities.
2. **Sequences of real numbers.** Convergence. Computation of limits.
3. **Continuity.** Limits of functions. Continuous functions. Properties. Weierstrass, Bolzano and Darboux theorems. Classification of discontinuities.
4. **Differentiability.** Differentiation rules. Rolle's and Mean Value theorem. Extreme values of functions. L'Hôpital's rule. Taylor's and Young's theorems. Applications.

4. Academic activities

Master classes: 50 hours.
Problem solving: 19 hours.
Computer classes: 6 hours.
Study: 105 hours.
Assessment tests: 7.5 hours.

5. Assessment system

During the course there will be several short examinations, which will be taken during lecture hours, and a global exam.

The dates and the contents covered in each short examination will be announced in advance. It is estimated that there will be two short examinations in each term, although this number might change if the circumstances so require. The short examinations marks will have a total weight of 20 percent in the mark.

The global exam will be taken in the official convocations, in the dates fixed by the Faculty of Sciences. It will have a total weight of 80 percent in the mark.

According to the University regulations, the students can dispense with the short examinations and take only the exams in the official exam periods, as a global test, obtaining in this way 100 percent of the mark.

The work in the computer classes will also be evaluated. Together with the global exam, there will be a computer practical exam for those who did not pass with their work during the course.

6. Sustainable Development Goals

4 - Quality Education
5 - Gender Equality
8 - Decent Work and Economic Growth