

27034 - Functional Analysis

Syllabus Information

Academic year: 2024/25

Subject: 27034 - Functional Analysis

Faculty / School: 100 - Facultad de Ciencias

Degree: 453 - Degree in Mathematics
647 - Degree in Mathematics

ECTS: 6.0

Year: 4

Semester: First semester

Subject type: Optional

Module:

1. General information

The purpose of this course is the study of the properties of infinite-dimensional vector spaces given by vector spaces of functions endowed with a norm. Special emphasis will be put in the study of Hilbert spaces, in which the norm comes from a scalar product, obtaining a concept of orthogonality and extending many properties of the Euclidean norm to the infinite-dimensional case.

2. Learning results

Students will reach a good comprehension of mathematical analysis in its deep connection with algebra and topology, culminating in this way the vision of analysis in the degree in mathematics. In particular, they will get to:

- Know the analytic and geometric forms of the Hahn-Banach theorem and its main consequences.
- Comprehend what completeness implies in relation to normed spaces, continuous and linear maps in this kind of spaces, and the spaces with a scalar product.

3. Syllabus

1. Normed and Banach spaces.
2. Fundamental theorems of functional analysis.
3. L_p spaces.
4. Modes of convergence of functions sequences.
5. Hilbert spaces.
6. Spectral theory of compact self-adjoint operators.

4. Academic activities

Master classes: 40 hours.

Problem solving: 20 hours.

Study: 83 hours.

Assessment tests: 7 hours.

5. Assessment system

The assessment will be made by a continuous evaluation system, which will consist of 4 tests of the same value. The date of each one of these 4 tests will be fixed early enough and, in case that they need to be done out of the regular lecture hours, it will be guaranteed that all the students can take them.

Each one of these tests will consist both in theoretical questions, which will consist on questions about definitions or proofs of results seen in class, as well as practical exercises, which will consist on the resolution of exercises similar to those treated in the lecture room and in the material provided by the instructor.

The criteria in the assessment will take into account the ability to provide precise definitions and correct proofs of the main results treated in the course, as well as the ability to solve different problems, in a correct way and relying on the results and definitions seen in the course.

The students will have the right of taking a global exam, in the dates of the official convocations, fixed by the Faculty of Science.

The final mark will be the maximum between the continuous evaluation (the average of the 4 tests) and the global exam.

6. Sustainable Development Goals

4 - Quality Education

5 - Gender Equality
8 - Decent Work and Economic Growth