Universidad Zaragoza

Academic Year/course: 2023/24

27008 - General Topology

Syllabus Information

Academic year: 2023/24
Subject: 27008 - General Topology
Faculty / School: 100 - Facultad de Ciencias
Degree: 453 - Degree in Mathematics
ECTS: 9.0
Year: 2
Semester: Annual
Subject type: Compulsory
Module:

1. General information

Topology is a central area of mathematics that studies the properties of geometric objects that are preserved by continuous transformations. It is a requirement in many other areas such as geometry or analysis.

The objective of the course is to introduce the basic concepts and tools of general topology. The language used in the course is based on set theory. It is axiomatically developed from the abstract definition of topological space. The examples, especially metric spaces, are essential to understand the presented concepts.

This course should serve to improve students' abstract thinking. In addition, their concepts will be used in other subjects such as Geometry of Curves and Surfaces, Topology of Surfaces, Differentiable Manifolds or Functional Analysis.

The approaches and objectives of this module are aligned with the Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda; the learning activities could contribute to some extent to the achievement of the goals 4 (quality education), 5 (gender equality), 8 (decent work and economic growth), and 10 (reducing inequality).

2. Learning results

- To know the concept of topology and which properties of metric spaces don't depend on the metric. To abstract this concept defining topologies in asbtract spaces. To relate topological spaces through continuous maps, and create new spaces from previous ones (subspaces, products, quotients...)
- To know the basic topological spaces (that is, properties about separation, compactness, connectedness, invariants under topological equivalences or homeomorphisms) and their characterizations. To know whether they are hereditary or not, and if they are conserved by products or quotients.
- To apply that knowledge to metric spaces -in particular euclidean spaces- knowing the topological properties of the most usual spaces in geometry (homogenous spaces, linear groups, manifolds...)

3. Syllabus

1. Metric spaces.
2. Topological spaces.
3. Position of a point relative to a subset.
4. Bases.
5. Countable axioms.
6. Separation axioms.
7. Products and quotients.
8. Compact spaces.
9. Connectivity.

4. Academic activities

Master classes: 60 hours.
Problem solving: 30 hours.
Project: 40 hours.
Study: 90 hours.

Assessment tests: 5 hours.

5. Assessment system

The final grade will be a weighted average between the evaluation throughout the course and the exams. There will be an exam at the end of the first semester and another one at the end of the second semester. In addition, the student can repeat the first semester exam at the end of the second.

The weight of the evaluation during the course will be 20%. When the student obtains a 4 or more in each of the partial exams, her grade will be

$$0.2\ EC + 0.40\ E1 + 0.40\ E2,$$

where EC is the continuous evaluation, E1 and E2 are the marks of the first and second semester exams respectively. Otherwise, the student will not pass in the first call, and her grade will be the minimum between 4 and the result of the previous formula.

In the second call there will be a single exam. For students who take this call, the mark will be

$$0.2\ EC + 0.8\ EF,$$

where EF is the exam grade for the second call, which must be greater than or equal to 4. Otherwise, the student will not pass in this call, and the grade will be the minimum between 4 and the resulting grade from the above formula.

Regardless of the above, according to current regulations, the student always has the right to be evaluated only by a global test.