Universidad Zaragoza

Academic Year/course: 2023/24

27031 - Dynamical Systems

Syllabus Information

Academic year: 2023/24
Subject: 27031 - Dynamical Systems
Faculty / School: 100 - Facultad de Ciencias
Degree: 453 - Degree in Mathematics
ECTS: 6.0
Year: 4
Semester: First semester
Subject type: Optional
Module:

1. General information

The purpose of this course is for the student to acquire the necessary knowledge to qualitatively study the systems that evolve with respect to a *time* variable and that present different parameters. Discrete and continuous dynamical systems will be studied, and the basic tools for their analysis, both theoretical and numerical, will be given.

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

- Recognize a dynamical system both in discrete and continuous time.
- Extract information about the qualitative behavior of a dynamical system.
- Analyze the stability of equilibrium points and periodic orbits of a dynamical system.
- Identify and classify bifurcations.
- Determine when the behavior of a dynamical system is chaotic.
- Model dynamical systems that come from physics, biology or engineering.

3. Syllabus

1. Dynamical systems.
2. Linear dynamical systems.
3. Equilibrium points.
4. Periodic orbits.
5. Bifurcations.
6. Chaotic systems.
7. Applications.

4. Academic activities

Master classes: 30 hours.
Problem solving: 15 hours.
Computer classes: 15 hours.
Project: 25 hours.
Study: 60 hours.
Assessment tests: 5 hours.

5. Assessment system

- Delivery of exercises (theoretical-practical) resolved on the scheduled dates and/or writing and oral presentation of a paper (40%).
- Carrying out exercises in class on the blackboard (20%).

- Delivery of reports with the results obtained in the practical sessions with the computer, suitably written (40%).

If the number of students were very high, the evaluation would consist of a test that would account for 70% of the mark and the previous activities the remaining 30%. All this without prejudice to the right that, according to current regulations, assists the student to present himself and, where appropriate, pass the subject by taking an overall test.