

27022 - Mathematical Modelling

Syllabus Information

Academic year: 2023/24

Subject: 27022 - Mathematical Modelling

Faculty / School: 100 - Facultad de Ciencias

Degree: 453 - Degree in Mathematics

ECTS: 6.0

Year: 4

Semester: First semester

Subject type: Compulsory

Module:

1. General information

This subject is an introduction to mathematical modelling, which is the art of applying mathematics to real life situations or to other scientific or technique fields. Mathematics are applied to know the causes governing processes or systems of other scientific or technique fields, looking for predicting or even controlling them. The aim is that the students know some classical models important in several fields and get used with the construction of mathematical models.

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

- Know the process of constructing mathematical models.
- Handle useful basic techniques in mathematical modeling.
- Understand, from classical models, the importance of applying mathematics to other fields, such as natural sciences, engineering, sociology or economy.

3. Syllabus

1. Mathematical modeling: phases, types of models and techniques.
2. Finite difference equations and discrete dynamic systems.
3. Positive matrices, Perron-Frobenius theorem and applications to economy and to Markov and Leslie processes.
4. Graph techniques, equilibrium models and applications to hydrocarbons.
5. Geometric modeling and representation and fitting techniques for the models construction.
6. Evolution continuous models and applications to populations growth.

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

Continuous evaluation consisting of:

- A written exam in November or December (50% of the final mark)
- Oral presentation of joint work (25% of the final mark)
- Active participation in computer classes (10% of the final mark)
- Active participation in master and problem solving classes (10% of the final mark)

However, according to university regulations, the students may choose to make a unique global exam