27022 - Mathematical Modelling

Información del Plan Docente

Academic Year	2018/19
Subject	27022 - Mathematical Modelling
Faculty / School	100 - Facultad de Ciencias
Degree	453 - Degree in Mathematics
ECTS	6.0
Year	4
Semester	Half-yearly
Subject Type	Compulsory
Module	---

1.General information

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, practice sessions, problem-solving sessions and tutorials.

4.2.Learning tasks

This course is organized as follows:

- **Lectures**. Two weekly hours. Techniques and illustrative examples on Mathematical Modeling are provided. The student should be able to apply mathematics to other fields and to analyze and interpret mathematical models.
- **Practice sessions**. One weekly hour.
- **Problem-solving session**. One weekly hour. Several computer practice sessions will take place in order to

illustrate mathematical models.
- **Tutorials**. In groups. At least one session.

4.3.Syllabus

This course will address the following topics:

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

4.4.Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course will be provided on the first day of class or please refer to the Faculty of Sciences website and Moodle.Theoretical classes: 2 hours per week

4.5.Bibliography and recommended resources

- Adam, John A.: Mathematics in nature : Modeling Patterns in the natural world / John A. Adam . Princeton [etc.] : Princeton University Press, cop. 2003
- Gershenfeld, Neil A.: The nature of mathematical modeling / Neil Gershenfeld . - 1st ed., reprinted with corrections Cambridge : Cambridge University Press, 2003
- Mooney, Douglas D.: A course in mathematical modeling / Douglas D. Mooney and Randall J. Swift [Washington] : The mathematical Association of America, cop. 1999
- Ruth, M. and Hannon, B.:Modeling Dynamic Economic Systems, Springer, New York, 2012.
- Yang, X.-S.:Mathematical Modeling with Multidisciplinary Applications, John Wiley and Sons, Chichester, 2013.