VNIVERSITAT DE VALÈNCIA

Course Guide
34172 Mathematic modelling

COURSE DATA

Data Subject	
Code	34172
Name	Mathematic modelling
Cycle	Grade
ECTS Credits	6.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
1107 - Degree in Mathematics	Faculty of Mathematics	3	First term

Subject-matter

Degree	Subject-matter	Character
1107 - Degree in Mathematics	13 - Mathematical modelling	Obligatory

Coordination

Name	Department
CANDELA POMARES, VICENTE FCO	363 - Mathematics
LOPEZ MACHI, RAFAEL FRANCISCO	363 - Mathematics

SUMMARY

The purpose of this course is to apply the concepts and techniques studied in previous courses to real-world problems, social science, experimental, etc.

The student will be introduced in mathematical modeling problems, including techniques for analysis and resolution. Thus, for a given model, we will try to solve it by analytical techniques and numerical tools; Also, studying in detail the models can be established variants and improvements through its parameters.

It will serve as models from experimental sciences, engineering i of the social sciences. At least one discrete model is treated by difference equations and recurrent by differential equations.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

The necessary basic knowledge for the start of this course have been studied in previous subjects of differential equations and numerical methods.

OUTCOMES

1107 - Degree in Mathematics

- Capacity for analysis and synthesis.
- Capacity for organization and planning.
- Capacity for criticism.
- Solve problems that require the use of mathematical tools.
- Ability to work in teams.
- Adapting to new situations.
- Possess and understand the mathematical knowledge.
- Apply the knowledge in the professional world.
- Expressing mathematically in a rigorous and clear manner.
- Reason logically and identify errors in the procedures.
- Capacity of abstraction and modeling.
- Participate in the implementation of software and learn mathematical software.
- Knowing the time and the historical context in which occurred the great contributions of women and men in the development of mathematics.

LEARNING OUTCOMES

The student must be able to analyze and describe mathematically problems of experimental or social sciences and select an appropriate mathematical model for description.

You must resolve, by exact or approximate methods, mathematical models that correspond to the problems studied.

You should know the solution obtained contrast with reality and suggest modifications in view of the discrepancies between the model and the observed data. Parameters in models should be able to adapt the parameter values to the data.

You must know how to interpret the results in order to obtain general properties of the model and

recognize other problems that can be adapted to the same model.

You must handle mathematical and computer tools in analyzing and solving problems.

DESCRIPTION OF CONTENTS

1. Introduction to mathematical modeling.

Mathematical description of well-defined problems. Generalities.

2. Mathematical models based on finite difference equations

Are presented and analyzed models of natural, physical and / or engineering sciences based on finite difference equations phenomena.

3. Mathematical models based on ordinary differential equations

Are presented and analyzed models of natural, physical and / or engineering sciences based on ordinary differential equations phenomena.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	24,00	100
Computer classroom practice	20,00	100
Classroom practices	10,00	100
Other activities	6,00	100
Development of group work	5,00	0
Readings supplementary material	5,00	0
Preparation of evaluation activities	30,00	0
Preparing lectures	10,00	0
Preparation of practical classes and problem	20,00	0
Resolution of case studies	20,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

The development of the course is structured around three axes: the theory sessions, practical sessions (in the classroom with computer) and tutorials and seminars.

As regards the former, the teacher will develop the main agenda items, using computer classroom where necessary to illustrate a particular point. The student must attend at the time of preparation of the classes scheduled for their optimal use. The practical classes so that students will check the level of acquired knowledge, facing relatively complex problems and analyzing the results. As before, students must prepare such sessions to perform experiments in the schedule.

EVALUATION

Learning assessment of knowledge and skills achieved by students will be continuously throughout the course and will consist of the following blocks of assessment:

1 Theory and practical: Since the objectives of the course will focus on the strengthening of computer calculation techniques, this evaluation will be conducted in two stages:

Continuous assessment of the practical sessions and reporting, with code results and comments. Carrying out checks on the practical content: up to 4 points, ie 40% of the final grade.

Final evaluation, consisting of a theoretical exam rated up to 5 points, ie 50% of the final grade.

2 seminars and tutorials: participation in these sessions with a maximum score of 1 point, ie measured, 10% of the final grade.

To pass the course will need to pass the assessment of each of the two blocks, therefore, the note must be equal to or greater than 0.5 points and 4.5 points block 2 in block 1, provided the score 1.ii subfields of 1.iy exceed 40% of the maximum score.

Corresponding to continuous assessment under paragraph 1.i in paragraph 2 shall be kept qualifications obtained in the two announcements of the academic year in which they are made, since its assessment would only be possible throughout the semester and never in the extraordinary examination.

REFERENCES

Basic

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-Referencia b1: Dennis G. Zill, Ecuaciones diferenciales con aplicaciones de modelado. Thomson Ed. 1997.

-Referencia b2: Stephen Lynch. Dynamical Systems with Applications using Mathematica. Birkhäuser, 2007.

-Referencia b3: Nail H. Ibragimov, A Practical Course un Differential Equations and Mathematical

Modelling, Higher Education Press. World Scientific Publishing Co Pte Ltd. 2010.

Additional

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-Referencia c1: Daniel Kaplan, Leon Glass. Understanding nonlinear dynamics. Springer. 1992.

-Referencia c2: Basmadjian Diran, Farnood Ramin, The Art of Modelling in Science and Engineering with Mathematica, Chapman & Hall/CRC. Second Edition. 2007.

-Referencia c3: Leah Edeltein-Keshet, Mathematical models in biology, SIAM, 2005.