Mathematical Modelling in the Environment

ECTS: 6 ECTS

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UNIVERSITY WHERE THE COORDINATOR IS: UNIVERSIDADE DE SANTIAGO DE COMPOSTELA

HAVE YOU GIVEN PERMISSION TO RECORD YOUR CLASSES? No

UNIVERSITY WHERE THE PROFESSOR José Manuel Rodríguez Seijo IS: UNIVERSIDADE DA CORUÑA

HAVE YOU GIVEN PERMISSION TO RECORD YOUR CLASSES? Yes

SUBJECT CONTENTS

Topic 1: Introduction.

1.1. The role of mathematical models in environmental sciences.

1.2. Analysis/control of environmental problems.

1.3. Choice of mathematical tools.

Topic 2: Getting started: Models of biological communities.

2.1. Communities of species.

2.2. Communities of two species (competition, symbiosis, commensalism, predator/prey, migration ...)

2.3. Age distribution in populations.

Topic 3: Propagation models for pollution.

3.1. Mathematical models concerning the air environment.

3.1.1. Basics.

3.1.2. Transport and diffusion models.

3.2. Mathematical models relating to the aquatic environment.

3.2.1. Model classification.

3.2.2. General models of adsorption and sedimentation.

3.2.3. Three-dimensional models.

3.2.4. Two-dimensional shallow water models.

3.2.5. One-dimensional models for rivers and canals.

3.2.6. Zero-dimensional models.

Topic 4: Control of environmental processes.

4.1. Formulations.

4.2. Realistic examples.

METHODOLOGY

The class is a combination of master session where the teacher will present the theoretical contents of the subject and problem and/or exercises solving (in these hours the teacher will solve problems of each of the items and will introduce new methods of resolution from a practical point of view). The student must also solve problems proposed by the teacher in order to apply the acquired knowledge.

LANGUAGE USED IN CLASS: Spanish

IS IT COMPULSORY TO ATTEND CLASS? Students can attend via conference system

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BIBLIOGRAPHY

C.R. Hadlock, Mathematical modeling in the environment , Mathematical Association of America, 1998.

N. Hritonenko – Y. Yatsenko, Mathematical modeling in economics, ecology and the environment, Kluwer Academic Publishers, 1999.

J. Pedlosky, Geophysical fluid dynamics, Springer Verlag, 1987.

SKILLS

Basic:

CG4: To have the ability to communicate the findings to specialist and non-specialist audiences in a clear and unambiguous way.

CG5: To have the appropriate learning skills to enable them to continue studying in a way that will be largely self-directed or autonomous, and also to be able to successfully undertake doctoral studies.

Specific:

CE1: To acquire a basic knowledge in an area of Engineering / Applied Science, as a starting point for an adequate mathematical modelling, using well-established contexts or in new or unfamiliar environments within broader and multidisciplinary contexts.

CE4: To be able to select a set of numerical techniques, languages and computer tools, suitable for solving a mathematical model.

CE7: To know how to model complex elements and systems or in poorly established fields, which lead to well-posed/formulated problems.

WILL YOU BE USING A VIRTUAL PLATFORM? Yes

https://moodle.udc.es/

http://www.usc.es/gl/servizos/ceta/tecnoloxias/campus-virtual.html

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WILL YOU BE USING ANY SPECIFIC SOFTWARE? No.

CRITERIA FOR THE 1ST ASSESSMENT OPPORTUNITY

1. Resolution of problems and/or exercises: At this point two aspects will be assessed:

   a) attendance and active participation in class (25% of the final mark).

   b) Individual theoretical exercises: Exercises that the teacher will propose in the classroom (25% of the final mark). Evaluated competences: CE1, CE4 and CE7.

2. Final exam (50% of the final mark). Evaluated competences: CE1, CE4 and CE7.

CRITERIA FOR THE 2ND ASSESSMENT OPPORTUNITY

The same as for the first assessment opportunity.
