Professional Software in Environmental Issues

ECTS: 6 ECTS

COORDINATOR: Carmen Rodríguez Iglesias (carmen.rodriguez@usc.es)

UNIVERSITY WHERE THE COORDINATOR IS: USC

HAVE YOU GIVEN PERMISSION TO RECORD YOUR CLASSES? No

LECTURER 1: Miguel Ángel Vilar Rivas (miguel.vilar@usc.es)

UNIVERSITY WHERE THE LECTURER 1 IS: USC

HAVE YOU GIVEN PERMISSION TO RECORD YOUR CLASSES? No

LECTURER 2: Francisco Javier Fernández Fernández (fjaviefernandez@cud.uvigo.es)

UNIVERSITY WHERE THE LECTURER 2 IS: UVigo

HAVE YOU GIVEN PERMISSION TO RECORD YOUR CLASSES? No

SUBJECT CONTENTS

I) MIKE21 Software

1. Introduction: framework.
2. Commercial Programme MIKE21.
   - Generalities.
   - Hydrodinamic Module (bidimensional hydrodinamic model of sallow water).

- Incorporating data observed: bathymetry, tide data, wind, etc..
- Viewing and extracting results.
- AD Module (two-dimensional transport model advective / dispersive).
- ECO Lab module (water quality models).
- Module Introduction ST (non-cohesive sediment transport).
- Introduction to the module MT (cohesive sediment transport).

II) Introduction to the AERMOD software package for atmospheric dispersion.

III) Introduction to the methodology of resolution and control of environmental problems FreeFem ++.

1 Approach environmental problem (Eutrophication of large bodies of water).

2. Numerical resolution with FreeFem++

METHODOLOGY

-Classes are necessarily taught in a computer room. In them, the teacher will present the types of problems to be solved, they will display the corresponding mathematical models and point out the elements related to the models to numerically solve them. Students will use software to solve specific problems.

-Each student will individually perform the tasks set in lessons. The faculty will address the issues raised by the students and will monitor the work done by each of them,

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LANGUAGE USED IN CLASS: Spanish, Galician

IS IT COMPULSORY TO ATTEND CLASS? In the university where the teacher is.

BIBLIOGRAPHY

Bruce Turner, Richard H. Schulze. Practical Guide to Atmospheric Dispersion Modeling. Trinity Consultants, Inc., and Air & Waste Management Association. 2006

The Mathematics of Models for Climatology and Environment, Nato ASI Series. I 48, (Díaz, J. I. ed.), Springer Verlag, Berlin, Heidelberg. 1997.

D. Francisco Javier Fernández Fernández, "Análisis teórico de ciertos problemas de control y aplicación de la Derivación Automática en su resolución Numérica" Tesis. Dpto. Matemática Aplicada.Universidad de Santiago de Compostela. 2004

García Chan, Nestor. "Diferentes estrategias para el análisis y resolución numérica de problemas de gestión medioambiental en zonas costeras". Tesis. Dpto. Matemática Aplicada. Univ. de Santiago de compostela, 2009.

Hervouet, Jean-Michel. "Hydrodinamics of free surface flows". John Wiley & Sons, 2007

Kundu, "Fluid Mechanics", Academia Press, 1990.

Partheniades, Emmanuel "Cohesive sediments in open channels". Elsevier, 2009

Samallo Celorio, María Luisa. "Desarrollo e integracion de modelos numéricos de calidad del agua en un sistema de información geográfica".Tesis. Dpto. de Ciencias y Técnicas del agua y del medio ambiente. Univ. de Cantabria. 2011.

Stoker, J. J. "Water Waves". Interscience, New York, 1957.

Vázquez-Méndez, M. E. "Análisis y control óptimo de problemas relacionados con la dispersión de contaminantes".Tesis. Dpto. Matemática Aplicada.Universidad de Santiago de Compostela. 1999.

Winterwerp, Johan C.-Van Kesteren, Walther G. M. "Introduction tho the physics of cohesive sediment in the marine environment". Elsevier 2004.

Zhen-Gang Ji, "Hidrodinamics and water quality. Modeling rivers, lakes and estuaries". John Wiley & Sons, 2008

Note: Other Bibliography will be given along the Course.

SKILLS

Basic:

CG1: To have knowledge that provide a basis or opportunity for originality in developing and / or applying ideas, often within a research context, knowing how to translate industrial needs in terms of R & D in the field of mathematics Industrial.

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

Specific:

CE4: To be able to select a set of numerical techniques, languages and tools, appropriate to solve a mathematical model.

CE5: To be able to validate and interpret the results, comparing them with visualizations, experimental measurements and functional requirements of the physical engineering system.

Numerical specialization:

CS1: To know, be able to select or use how to handle most suitable professional software tools (both commercial and free) for the simulation of processes in the industrial and business sector.

CS2: To adapt, modify and implement software tools for numerical simulation.

WILL YOU BE USING A VIRTUAL PLATFORM? No.

WILL YOU BE USING ANY SPECIFIC SOFTWARE? Yes. MIKE21

CRITERIA FOR THE 1ST ASSESSMENT OPPORTUNITY

Tasks that will be assessed:

- Attendance to classes is compulsory. It will help teach-student relations.

- Individual Exercises: exercises that the teacher will propose along the course.

Score:

Tasks: Maximum Punctuation

Exam: 7

Works: 3

Total: 10

CRITERIA FOR THE 2ND ASSESSMENT OPPORTUNITY

The same as for the 1st assessment opportunity.