Mathematical analysis and modelling methods applied to the Environment

Synopsis

Tools of numerical resolution adapted to the problems encountered in the quantitative study of the environment.

Aims

- To provide solid mathematical tools to construct and interpret physical and biological models in the marine environment.

Objectives

At the end of the unit, you should:

1. understand the modelling tools useful for the study of the marine environment.

Key Skills Acquired

At the end of the unit, you should be able to:

1. work out tools of numerical resolution adapted to the problems encountered in the quantitative study of the environment.
2. work out a digital model for a new problem, while being conscious of the inherent limitations.

Syllabus

- History of modelling, recalls of the basic mathematical concepts, discretization of oceanographic processes, Coriolis, diffusion, eccentric grids, waves of gravity, diagrams of advection, treatment of the pressure, mode-splitting, Poisson's equations, concepts of nesting, curvilinear coordinates, assimilation of data, adaptive grids

Learning & Teaching (30 hr Th; 30 hr Pr)

- Lectures: 2 hr/wk
- Making of a tool for simulation for a particular process. This tool will be applied by in particular to analyze the effect of different approaches to the solution of a physical or biological problem. Example: development of a model allowing to study the oscillations of the surface in a lake.

Teaching Staff

J Beckers (Coord.);

Semester: 1

Timetable slot To be advised

ECTS: 6

Level: Optional

Bibliography

- The notes of course will be available via WWW in format pdf.
- Electronic copies of interactive “transparencies” are also deposited there under format pdf. http: /modb.oce.ULiège.ac.be/cours/MECA055/accueil .html

Assessment

- Written examination (40%)
- Oral examination (40%)
- Practical examination (20%)

Course Evaluation

By completion of University Unit Evaluation Questionnaire by students, annual assessment by Unit Co-ordinator. A full external review by the ULiège Academic Quality & Standards Committee