IDENTIFYING DATA
Modelling

Subject	Modelling			
Code	V10G061V01410			
Study programme	Grado en Ciencias del Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Souto Torres, Carlos Alberto			
Lecturers	Souto Torres, Carlos Alberto			
E-mail	ctorres@uvigo.es			
Web	http://https://www.uvigo.gal/estudar/organizacion-academica/departamentos/fisica-aplicada			
General description	The student will learn how to operate an oceanographic numerical simulation model. In order to achieve this goal, besides the specifics of the simulation code, he/she will learn some basics of the operative system Linux, NetCDF file format and Matlab. This is an English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results

Code	
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
B3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
C4	Know, analyze and interpret the physical properties of the ocean according to current theories, as well as to know the most relevant sampling tools and techniques.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
Theoretical and practical knowledge on numerical modelling in oceanography. The student will have capacity to understand the results of a numerical simulation, in what consists, which are the necessary forcings, etc. As well as be able to implement a numerical opensource model, to simulate the physics and the biogeochemistry.	A4 A5	B3	C4	D1 D2

Contents

Topic	
Ocean equations.	Discretization and introduction of the ocean equations in the model.
Matlab.	Basics of Matlab coding (loops, conditional, input and output of data). Examples.
Numerical integration methods	Implicit and explicit methods. Runge-Kutta, Predictor-Corrector, Leap-Frog, etc.
NetCDF data files.	Structure of a NetCDF file: Global and local attributes, dimensions, data. Reading and writing of NetCDF files.
The ROMS model.	Introduction. Model input structure. Bathymetry, forcing and boundary condition.

Examples with ROMS.		Run and analysis of simple examples.	
Nesting with ROMS.		Nested grids: Why and how. Structure, run and analysis of results.	
Biogeochemical models.		Examples with simple biogeochemical models. NPDZ and N2P2Z2D2. The PISCES module.	

Planning

	Class hours	Hours outside the classroom	Total hours
Practices through ICT	20	20	40
Lecturing	18	18	36
Seminars	14	14	28
Presentation	5	5	10

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
	Description
Practices through ICT	Using Linux as the operative system and Matlab as a tool, the student will learn to use the NetCDF data file format and the use of a numerical simulation model.
Lecturing	The equations of the ocean and different methods to solve those equations numerically with a computer code will be introduced to the student.
Seminars	Simple differential equations will be solved numerically, learning basic programming commands and some visualisation tools.

Personalized assistance

Methodologies	Description
Lecturing	Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation
Practices through ICT	Will be adapted to the timeframe determined by the Faculty's dean.
Seminars	The students will implement different programming codes to solve differential equations. The fulfillment of the aims fixed in the seminars will be evaluated.

Tests	Description
Presentation	The final work will be presented to all the other students and the teacher.

Assessment

	Description	Qualification	Training and Learning Results	
Practices through ICT	The consecution of different goals (preparation of the input data, run of the model, preparation of graphics with the results, etc...) will be evaluated following a previously informed rubric and/or a test.	20	B3	D2
Seminars	Evaluarase a destreza en desenrrolo de distinto código computacional (integración numérica de ecuaciones diferenciais sinxelas, código de visualización, etc). The hability to develop of computational code will be tested (numercial integration of simple differential equations, visualization tools, etc).	40	A5	D1 D2
Presentation	The previous qualification will be given depending on a final presentation.	40	A4 A5	C4 D1

Other comments on the Evaluation

Global evaluation option.

In the case to opt by global evaluation, the student have to request it in the period and form marked by centre, that will be published previous to the start of the course. The proofs will take place the same official testing date, having more time for his development.

Extraordinary evaluation (2nd opportunity)

There will be the possibility of a standalone proof, in the form of a presentation of the work done, or to recover individually each one of the three sections of the first opportunity, with the same evaluation criteria.

<u>Ethic Commitment</u>

It requires of the students that *curse this matter a responsible and honest behaviour. It considers inadmissible any form of fraud (copy or plagiarism) directed to *falsear the level of knowledges and skills reached in all type of proof, report or work. The fraudulent behaviours *podrÃ*n suppose suspend the subject during a complete course. CarryÃ an internal register of these performances so that, in case of *reincidencia, request the opening to the rectorship of a disciplinary file

The date, hour and place of the proofs will be published in the Faculty's official webpage:

http://mar.uvigo.es/alumnado/examenes

Sources of information

Basic Bibliography

Cushman-Roisin, Benoit and Beckers, Jean-Marie, **Introduction to Geophysical Fluid Dynamics. Physical and Numerical Aspects**, Academic Press, 2009

Complementary Bibliography

Recommendations

Subjects that it is recommended to have taken before

Ocean Dynamics/V10G061V01402