Universida_{de}Vigo

IDENTIFYING DATA

(*)Métodos Numéricos para Ecuacións en Derivadas Parciais

Subject	(*)Métodos Numéricos para Ecuacións en Derivadas Parciais
Code	V05M135V01104
Study programme	(*)Máster Universitario en Matemática Industrial

Descriptors	ECTS Credits		Choose	Year	Quadmester
	6		Mandatory	1st	1st

Teaching language	Spanish
Department	
Coordinator	Fernández Manin, Generosa
Lecturers	Fernández Manin, Generosa García Lomba, Guillermo Godoy Malvar, Eduardo
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General description	In this matter , using simple examples, we give a introduction to several numerical methods for the resolution of equations in partial derivatives and we solve, using COMSOL Multiphysics, some real problems simplified.

Competencies

Code	
A4	(*)Ser capaz de seleccionar un conjunto de técnicas numéricas, lenguajes y herramientas informáticas, adecuadas para resolver un modelo matemático.

Learning aims

Expected results from this subject	Typology	Training and Learning Results
Be able to select numerical methods, software and computer tools, to resolve a mathematical model.	know	A4

Contents

Topic	
Introduction to the numerical methods for the resolution of Differential Equations: finite differences, finite elements, finite volumes.	Generic description of the methods.
Methods of finite differences and finite elements in one dimensional problems.	Formulation of the methods, discretisation and numerical resolution. Analysis of the convergence and error estimates.
Methods of finite differences and finite elements in several dimensions: elliptical, parabolic and hyperbolic problems.	Discretization, numerical resolution and error estimates.
Practices with COMSOL-MULTIPHYSICS	Numerical resolution and analysis of results: thermal problems, solids, multhiphysics, etc.

Planning

	Class hours	Hours outside the classroom	Total hours
Troubleshooting and / or exercises	4	12	16
Practice in computer rooms	12	12	24

Master Session	26	52	78
Long answer tests and development	2	10	12
Practical tests, real task execution and / or simulated.	2	4	6
Troubleshooting and / or exercises	0	14	14

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

Methodologies

	Description
Troubleshooting and / or exercises	The student has to resolve and deliver theoretical exercises of compression of the methods, practical of application to concrete problems and resolved with some software of numerical simulation: Matlab or Comsol Multiphysics.
Practice in computer rooms	In the computer laboratory and using COMSOL Multiphysics resolve real cases simplified of diverse subjects: thermal, linear elasticity, electromagnetism, etc.
Master Session	These classes are devoted to explain the theoretical contents, to resolve some exercise to understand the methods and to introduce the practices of laboratory.

Personalized attention

Methodologies	Description
Master Session	It offers the possibility that the student in person, through the email or of the page of the *asignatura receive answer to the doubts posed as well as additional explanations.
Troubleshooting and / or exercises	It offers the possibility that the student in person, through the email or of the page of the *asignatura receive answer to the doubts posed as well as additional explanations.
Practice in computer rooms	It offers the possibility that the student in person, through the email or of the page of the *asignatura receive answer to the doubts posed as well as additional explanations.

Tests	Description
Long answer tests and development	It offers the possibility that the student in person, through the email or of the page of the *asignatura receive answer to the doubts posed as well as additional explanations.
Practical tests, real task execution and / or simulated.	It offers the possibility that the student in person, through the email or of the page of the *asignatura receive answer to the doubts posed as well as additional explanations.

Assessment

	Description	Qualification
Troubleshooting and / or exercises	They mark the exercises delivered resolved. The deadline to deliver these exercises is the day of the examination, at the end of course.	25
Practice in computer rooms	The practices of laboratory will be face-to-face(in Vigo) and will take place the following Tuesdays: 12 and 26 November, 10 and 17 December. All mark the same.	40
Master Session	It marks the assistance and participation in class.	5
Long answer tests and development	It consists in a proof written at the end of course of two hours. According to the planned calendar will be in Vigo on 17 January to the 10 am.	20
Practical tests, real task execution and / or simulated.	It is a practice more than laboratory that the student has to resolve of autonomous form the same day of the proof of long answer, according to the calendar foreseen on 17 January.	10

Other comments on the Evaluation

Sources of information

Eriksson, K - Estep, D - Hansbo, P. - Johnson, C., **Computational differential equations**, 1996,

Johnson, C., **Numerical solution for partial differential equations**, 2009,

LeVeque,R.J., **Finite Difference Methods for Ordinary and Partial Differential Equations: Steady State and Time Dependent Problems**, 2007,

Reddy, J.N., **An introduction to the Finite Element Method**, 2ª y 3ª(1993 y 2006),

Samarskii, A.A, **, The Theory of Difference Schemes**, 2001,

Strickwerda, J.C, **Finite Difference Schemes and Partial Differential Equations**, 1999,

Recommendations

Subjects that continue the syllabus

(*)Ampliación de Elementos Finitos/V05M135V01218
(*)Mecánica de Sólidos/V05M135V01202

Subjects that are recommended to be taken simultaneously

(*)Análise Variacional de Ecuación en Derivadas Parciais/V05M135V01211

(*)Deseño Asistido por Ordenador (CAD)/V05M135V01108

(*)Mecánica de Medios Continuos/V05M135V01105