



## Teaching Guide

Identifying Data					2017/18
<b>Subject (*)</b>	Computational fluid dynamics I		<b>Code</b>	632844205	
<b>Study programme</b>	Mestrado Universitario en Enxeñaría da Auga (plan 2012)				
Descriptors					
Cycle	Period	Year	Type	Credits	
Official Master's Degree	1st four-month period	First	Optativa	6	
<b>Language</b>	English				
<b>Teaching method</b>	Face-to-face				
<b>Prerequisites</b>					
<b>Department</b>	Enxeñaría Civil Matemáticas				
<b>Coordinador</b>	Rodríguez-Vellando Fernández-Carvajal, Pablo	<b>E-mail</b>	pablo.rodriguez-vellando@udc.es		
<b>Lecturers</b>	Fe Marques, Jaime Naves García-Rendueles, Acacia Rodríguez-Vellando Fernández-Carvajal, Pablo	<b>E-mail</b>	jaime.fe@udc.es acacia.naves@udc.es pablo.rodriguez-vellando@udc.es		
<b>Web</b>	<a href="http://caminos.udc.es/info/asignaturas/201/masterindex.html">http://caminos.udc.es/info/asignaturas/201/masterindex.html</a>				
<b>General description</b>	Fundamentals of open channel flow and computational fluid dynamics. Fundamental equations: Saint-Venant, Navier-Stokes, potential flow, stream-vorticity, Stokes flow, shallow water, convection-diffusion, Darcy,... Fundamentals of Matlab programming. Finite element programming of hydrodynamic, porous media and geochemical models. Introduction to Finite Volumes.				

## Study programme competences

Code	Study programme competences

## Learning outcomes

Learning outcomes	Study programme competences		
Ability to apply the fluid mechanics and the fundamental equations of flow calculation pressure pipes and sheet free.	A1	B1	C1
Understanding the basics of computational fluid dynamics (CFD). Ability to develop codes that solve incompressible flow both free surface and porous medium. Knowledge of numerical models applied to hydraulic engineering. Capacity use and analyze the results of a hydraulic model. Ability to design, develop and analyze numerical schemes used in a hydraulic model.	A1	B1	C1
	A1	B1	C1
		B1	C1
		B1	C1
		B1	C1
		B1	C1
		B1	C1
		B1	C1
		B1	C1
		B1	C1
		B1	C1
		B1	C1
		B1	C1
		B1	C1
		B1	C1
		BJ1	
		BJ1	
		BJ1	
		BJ1	

## Contents



Topic	Sub-topic
Fundamentals of Open Channel flow (revision)	Open Channel flow
Fundamentals of Computational Fluid Dynamics	Computational Fluid Dynamics
Governing equations	Saint-Venant Navier-Stokes Potential flow Stream-vorticity Stokes flow Shallow water Convection-diffusion Darcy,...
Fundamentals of Matlab programming	Matlab programming
Finite Element programming of fluid models	Hydrodynamic models Porous media models Geochemical models
Fundamentals of Finite Volumes programming	Finite Volumes programming
Comercial programmes	Comercial programmes

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Seminar	A1 A2 A3 A17 B8 B9 B10 B11 B12 B13 B14 B15 B1 B2 B3 B4 B5 B6 B7 B16 B17 B18 B19 C1 C2 C3 C4 C5 C6 C7 C8	30	30	60
Guest lecture / keynote speech	A1 A2 A3 A17 B8 B9 B10 B11 B12 B13 B14 B15 B1 B2 B3 B4 B5 B6 B7 B16 B17 B18 B19 C1 C2 C3 C4 C5 C6 C7 C8	30	30	60
Personalized attention		30	0	30

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

Methodologies	
Methodologies	Description
Seminar	Practical lectures related to the theoretical aspects regarded at the magistral lectures
Guest lecture / keynote speech	Regular lectures where the main theoretical contents of the subjects are regarded

Personalized attention	
Methodologies	Description
Seminar	Personalized attention to be provided for the seminars

Assessment			
Methodologies	Competencies	Description	Qualification



Guest lecture / keynote speech	A1 A2 A3 A17 B8 B9 B10 B11 B12 B13 B14 B15 B1 B2 B3 B4 B5 B6 B7 B16 B17 B18 B19 C1 C2 C3 C4 C5 C6 C7 C8	The knowledge of the concepts developed at the magistral lectures will be assessed and considered for the final mark	50
Seminar	A1 A2 A3 A17 B8 B9 B10 B11 B12 B13 B14 B15 B1 B2 B3 B4 B5 B6 B7 B16 B17 B18 B19 C1 C2 C3 C4 C5 C6 C7 C8	The attendance to the seminars and the work being developed at the seminars will be considered for the final mark	50

Assessment comments

Sources of information

<b>Basic</b>	<ul style="list-style-type: none"> <li>- G. Carey, J. Oden (1984). Finite Elements. Prentice-Hall</li> <li>- A. Chadwick (1986). Hydraulics in Civil Engineering. Allen&amp;Unwin</li> <li>- J. Donea (2003). Finite Element Methods for Flow Problems. Wiley</li> <li>- P. Gresho, R Sani (2000). Incompressible flow and the finite element method. Wiley</li> <li>- O. Pironneau (1989). Finite Element Methods for Fluids. Wiley</li> <li>- J. Puertas Agudo (2000). Apuntes de Hidráulica de Canales. Nino</li> <li>- Singiresu Rao (2005). The Finite Element Method in Engineering. Elsevier</li> <li>- O. C. Zienkiewicz, R.L. Taylor (1982). The Finite Element Method. Vol 3, Fluid dynamics. Mc Graw Hill</li> </ul>
<b>Complementary</b>	

Recommendations

Subjects that it is recommended to have taken before

Subjects that are recommended to be taken simultaneously

Subjects that continue the syllabus

Other comments

(\*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.