		Teaching	Guide		
	Identifying Data				
Subject (*)	Computational fluid dynamics I Code			632844205	
Study programme	Mestrado Universitario en Enxeñ	aría da Auga (pla	ın 2012)		
		Descrip	tors		
Cycle	Period	Year	r	Туре	Credits
Official Master's Degre	ee 1st four-month period	First	t	Optional	6
Language	English		'		·
Teaching method	Face-to-face				
Prerequisites					
Department	Enxeñaría CivilMatemáticas				
Coordinador	Rodríguez-Vellando Fernández-C	Carvajal,	E-mail	pablo.rodriguez-vellando@udc.es	
	Pablo				
Lecturers	Fe Marques, Jaime		E-mail	jaime.fe@udc.es	3
	Naves García-Rendueles, Acacia	a		acacia.naves@u	ıdc.es
	Rodríguez-Vellando Fernández-G	Carvajal,		pablo.rodriguez-	vellando@udc.es
	Pablo				
Web	http://caminos.udc.es/info/asigna	turas/201/master	index.html	'	
General description	Fundamentals of open channel fl	ow and computat	ional fluid dynam	ics. Fundamental equa	ations: Saint-Venant,
	Navier-Stokes, potential flow, stre	eam-vorticity, Sto	kes flow, shallow	water, convection-diffe	usion, Darcy, Fundamentals
	Matlab programming. Finite elem	ent programming	of hydrodynamic	c, porous media and ge	eochemical models. Introductio
	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	A1	B1	C1	
ree surface and porous medium. Knowledge of numerical models applied to hydraulic engineering. Capacity use and analyze	A1	B1	C1	
he results of a hydraulic model. Ability to design, develop and analyze numerical schemes used in a hydraulic model.	A1	B1	C1	
		B1		
		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	Student?s personal	Total hours
		hours	work hours	
Seminar	A1 A2 A3 A17 B8 B9	30	30	60
	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			
Guest lecture / keynote speech	A1 A2 A3 A17 B8 B9	30	30	60
	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			
Personalized attention		30	0	30

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

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

		Assessment	
Methodologies	Competencies	Description	Qualification

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

Assessment comments

	Sources of information
Basic	- G. Carey, J. Oden (1984). Finite Elements. Prentice-Hall
	- A. Chadwick (1986). Hydraulics in Civil Engineering. Allen&Unwin
	- J. Donea (2003). Finite Element Methods for Flow Problems. Wiley
	- P. Gresho, R Sani (2000). Incompressible flow and the finite element method. Wiley
	- O. Pironneau (1989). Finite Element Methods for Fluids. Wiley
	- J. Puertas Agudo (2000). Apuntes de Hidráulica de Canales. Nino
	- Singiresu Rao (2005). The Finite Element Method in Engineering. Elsevier
	- O. C. Zienkiewicz, R.L. Taylor (1982). The Finite Element Method. Vol 3, Fluid dynamics. Mc Graw Hill
Complementary	

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.