UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				2019/20
Subject (*)	Computational fluid dynamics I		Code	632844205
Study programme	Mestrado Universitario en Enxeñaría da Auga (plan 2012)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	1st four-month period	First	Optional	6
Language	English			
Teaching method	Face-to-face			
Prerequisites				
Department	Enxeñaría CivilMatemáticas			
Coordinador	Rodríguez-Vellando Fernández-Carvajal, Pablo	E-mail	pablo.rodriguez-vellando@udc.es	
Lecturers	Fe Marques, Jaime Naves García-Rendueles, Acacia Rodríguez-Vellando Fernández-Carvajal, Pablo	E-mail	jaime.fe@udc.es acacia.naves@udc.es pablo.rodriguez-vellando@udc.es	
Web	http://caminos.udc.es/info/asignaturas/201/masterindex.html			
General description	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 / results	
Code	Study programme competences / results

Learning outcomes			
Learning outcomes	Study programme competences / results		
Ability to apply the fluid mechanics and the fundamental equations of flow calculation pressure pipes and sheet free. 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 A1 A1 A1	B1 B1 B1 B1 B1 B1 B1 B1 B1 B1 B1 B1 B1 B1 B1 BJ1 BJ1 BJ1 BJ1	C1 C1 C1 C1 C1 C1 C1 C1

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 / Results	Teaching hours (in-person & virtual)	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 semminars

Assessment

Methodologies	Competencies / Results	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 assesed 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 semminars and the work being developed at the semminars will be considered for the final mark	50

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