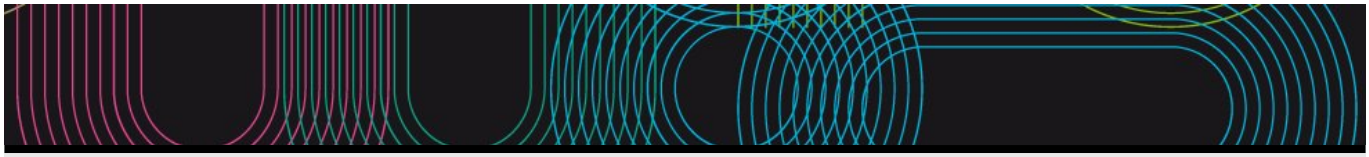

IDENTIFYING DATA				
Fluid Mechanics				
Subject	Fluid Mechanics			
Code	V05M135V01201			
Study programme	Máster Universitario en Matemática Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	1st	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Martín Ortega, Elena Beatriz			
Lecturers	Martín Ortega, Elena Beatriz Meis Fernández, Marcos			
E-mail	emortega@uvigo.es			
Web	http://www.m2i.es/docs/modulos/MESimNumerica/MBasica/1.%20Mecanica%20de%20fluidos.pdf			
General description	Modelling course of fluid dynamic problems that appear in the industrial problems. 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	
C1	(*)Alcanzar un conocimiento básico en un área de Ingeniería/Ciencias Aplicadas, como punto de partida para un adecuado modelado matemático, tanto en contextos bien establecidos como en entornos nuevos o poco conocidos dentro de contextos más amplios y multidisciplinares.
C2	(*)Modelar ingredientes específicos y realizar las simplificaciones adecuadas en el modelo que faciliten su tratamiento numérico, manteniendo el grado de precisión, de acuerdo con requisitos previamente establecidos.
C6	(*)Ser capaz de extraer, empleando diferentes técnicas analíticas, información tanto cualitativa como cuantitativa de los modelos

Expected results from this subject	Training and Learning Results
Capacity to select the appropriate model for a real fluid-dynamic problem	C2 C6
Understanding of the basic properties of the main models	C1 C2
Knowledge of the analysis techniques for the solutions of the models	C1 C6

Contents	
Topic	
Main models of the dynamics of fluids	Conservation laws for Newtonian fluids. Adimensionalisation of the model equations. Physical meaning of the main nondimensional numbers in the dynamics of fluids: Mach, Reynolds, Froude, Prandtl, Peclet, Grashof, Nusselt. Deduction of the most common fluid dynamic models, e.g. limit models, from the adimensional numbers

Perfect incompressible flows	Equations for the vorticity evolution in a perfect flow. Study of irrotational and potential flows. Limitations of the potential model. Examples of potential flows and applications. Some ideas of the lift theory.
Viscous incompressible flows	Some particular solutions of the steady incompressible Navier-Stokes equations Elementary analysis of the boundary layers: basic analysis and study of the Blasius problem Observations on the stability of steady laminar viscous solutions Some examples of unsteady hydrodynamics
Turbulent flows	Introduction Inviability of the direct numerical simulation (DNS) Closure problem in turbulence equations Models of turbulence
Flows with heat transfer	Equations of non-reactive flows for low Mach number Forced convection Free convection.

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	0	1
Lecturing	30	60	90
Problem solving	4	8	12
Project based learning	1	12	13
Case studies	10	20	30
Essay questions exam	4	0	4

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

Methodologies

	Description
Introductory activities	Dedicated to the aims and organisation of the course/lectures contents
Lecturing	Lectures intended to present the theoretical contents of each lesson
Problem solving	Modelling exercises of real fluid dynamic problems of different nature to practice the adquired knowledge on the meaning of dimensionless numbers
Project based learning	It will tackle the complete modelling of a fluid dynamic industrial problem
Case studies	Sesions devoted to the modelization of real fluid dynamic industrial problems and their analysis

Personalized assistance

Methodologies	Description
Introductory activities	The students will be given guidance and advice about appropriate bibliography and information related with the course

Assessment

	Description	Qualification	Training and Learning Results
Project based learning	Evaluation of the works/problems proposed presented by the student	40	C1 C2 C6
Essay questions exam	Written proof of the study of a case and his analysis	60	C1 C2

Other comments on the Evaluation

Sources of information

Basic Bibliography

Barrero, A. y Pérez-Saborid, M,, **Fundamentos y aplicaciones de la Mecánica de fluidos,**, 2005
Panton, R.L,, **Incompressible Flow,**, 3rd, 2005
White, F.M.,, **Heat and mass transfer,**, 1988
Wilcox, D.C.,, **Turbulence Modelling for CFD,**, 3rd ed., 2006
Kundu, P. K., Cohen, I. M., & Hu, H. H, **Fluid mechanics**, 6th ed., 2004

Complementary Bibliography

Recommendations

Subjects that continue the syllabus

MEMS Heat Transfer Fluid and Power-MEMS/V05M135V01209
Professional Software in Fluid Mechanics/V05M135V01212

Subjects that are recommended to be taken simultaneously

Numerical Methods for Partial Differential Equations/V05M135V01104

Subjects that it is recommended to have taken before

Differential Equations and Dynamic Systems/V05M135V01102
Partial Differential Equations/V05M135V01103
Mechanics of Continuous Media/V05M135V01105