Teaching Guide				
Identifying Data				2023/24
Subject (*)	Continuum mechanics		Code	614855205
Study programme	Mestrado Universitario en Matemática Industrial (2013)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	1st four-month period	First	Optional	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Matemáticas			
Coordinador	Arregui Alvarez, Iñigo	E-mail	inigo.arregui@udc.es	
Lecturers	Arregui Alvarez, Iñigo Rodriguez Seijo, Jose Manuel	E-mail	inigo.arregui@udc.es jose.rodriguez.seijo@udc.es	
Web	http://www.m2i.es/docs/modulos/MESimNumerica/MMContinuos/Mecanica%20de%20los%20medios%20continuos.pdf			
General description				

Study programme competences / results	
Code	Study programme competences / results
A1	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.
A2	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.
A9	Conocer, saber seleccionar y saber manejar las herramientas de software profesional (tanto comercial como libre) más adecuadas para la simulación de procesos en el sector industrial y empresarial.
B3	Ser capaz de integrar conocimientos para enfrentarse a la formulación de juicios a partir de información que, aun siendo incompleta o limitada, incluya reflexiones sobre las responsabilidades sociales y éticas vinculadas a la aplicación de sus conocimientos.

Learning outcomes			
Learning outcomes	Study programme competences / results		
Reaching a basic knowledge in mechanics, as a starting point for an adequate mathematical modelling	AC1 AC2 AC9		
Be able to integrate knowledges to proceed to the formulation of decissions.	AC1 AC2	BC2	

Contents	
Topic	Sub-topic
Introduction	Tensor algebra and analysis. Polar decomposition, divergence and Stokes theorems
Curvilinear coordinates	Vector bases and curvilinear coordinates. Vector fields. Differential operators in curvilinear coordinates
Kinematics	Material bodies. Motion and deformation, types of motions. Transport theorems. Isochoric motions, spin, circulation, vorticity
Conservation laws	Mass. Linear and angular moments. Force and stress. Moment equilibrium and its consequences. Piola-Kirchhoff tensor. Energy conservation, Clausius-Duhem inequality

Change of observer	Change of observer. Material indifference pinciple
Some simple models	Constitutive hypotheses. Ideal fluids. Navier-Stokes equations. Elastic bodies. Thermoelasticity

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Problem solving	A9 B3	13	45	58
Mixed objective/subjective test	A1 A2 B3	4	4	8
Guest lecture / keynote speech	A1 A2	41	42	83
Personalized attention		1	0	1
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Problem solving	Resolution, by the student, of some exercises of continuum mechanics
Mixed objective/subjective test	Theorical-practical control
Guest lecture / keynote speech	Exposition, by the teacher, of the contents and resolution of some exercises

Personalized attention	
Methodologies	Description
Problem solving	The teacher will help the students, when necessary, in the resolution of the proposed exercises

Assessment			
Methodologies	Competencies / Results	Description	**Qualification**
Problem solving	A9 B3	Resolución de exercicios e cuestións teórico-prácticas por parte do alumno, con axuda de bibliografía	40
Mixed objective/subjective test	A1 A2 B3	Resolución de exercicios e cuestións teórico-prácticas nunha proba presencial	60

Assessment comments
To surpass the matter, the student will have to obtain at least a qualification of 4 in the mixed objective/subjective proof. Both methodologies of evaluation will be taken into account, with the indicated percentages, in all the opportunities empoyed by the student.

Sources of information	
Basic	- M. E. Gurtin (1981). An Introduction to Continuum Mechanics. Academic Press. Boston - O. López Pouso (2002). "An Introduction to Continuum Mechanics" de M. E. Gurtin. Ejercicios Resueltos (capí-tulos I-VI). Publicacións Docentes do Departamento de Matemática Aplicada. Univ. de Santiago de Compostela

Complementary	- Y. C. Fung (1994). A First Course in Continuum Mechanics. Prentice Hall - K. Hutter, K. Jöhnk (2004). Continuum Methods of Physical Modeling. Springer - A. Bermúdez de Castro (2004). Continuum Termomechanics. Birkhauser - N. Bobillo Ares (2003). Introducción a la geometría y cinemática de medios continuos. Servicio de Publicaciones de la Unviersidad de Oviedo - R. Temam, A. Miranville (2001). Mathematical Modeling in Continuum Mechanics. Cambridge University Press - L. A. Segel (1987). Mathematics Applied to Continuum Mechanics. Dover, New York - G. Duvaut (1990). Mécanique des Milieux Continus. Masson, París

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously
Partial differential equations/614855203
Subjects that continue the syllabus
Fluid mechanics/614855206 Solid mechanics/614855207
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.