Teaching Guide				
Identifying Data				2017/18
Subject (*)	Vicoelasticity of materials		Code	730495002
Study programme	Mestrado Universitario en Materiais Complexos: Análise Térmica e Reoloxía (plan 2012)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	2nd four-month period	First	Obligatoria	3
Language	English			
Teaching method	Face-to-face			
Prerequisites				
Department	Enxeñaría Naval e Industrial			
Coordinador	Artiaga Diaz, Ramon Pedro	E-mail	ramon.artiaga@udc.es	
Lecturers	Artiaga Diaz, Ramon Pedro López Beceiro, Jorge José	E-mail	ramon.artiaga@udc.es jorge.lopez.beceiro@udc.es	
Web				
General description	This course aims to complete the viscoelasticity introduced during the first module in France (UEF 1) emphasizing the coupling with the thermal properties.			

Study programme competences / results	
Code	Study programme competences / results
A1	Set up and conduct tests using the techniques of thermal analysis and rheology most appropriate in each case, within the scope of complex materials
A2	Identify and evaluate the different types of complex materials
B2	The students have the skill to apply their knowledge and their ability to solve problems in new or unfamiliar contexts within broader (or multidisciplinary) contexts related to their field of study
B4	That the students can communicate their conclusions and the knowledge and last reasons behind that conclusions to specialized and non specialized audience in a clear and unambiguous way
B8	Applying a critical, logical and creative way of thinking
B13	Analysis-oriented attitude
B21	To assess the importance of research, innovation and technological developments in the socio-economic and cultural progress of society
C2	Have a good command of spoken and writing expression and understanding of a foreign language.
C6	Critically assessing the knowledge, technology and information available to solve the problems they face with.
C7	To assume as a professional and citizen the importance of learning throughout life.

Learning outcomes			
Learning outcomes	Study programme competences / results		
Determining what type of rheometer is appropriate depending on the material	AR2	BR2 BR8 BR13 BR21	CR6 CR7
To distinguish between different viscoelastic behavior.	AR2	BR4 BR8 BR13 BR21	CR2 CR6 CR7
Properly set up the test conditions.	AR1 AR2	BR2 BR8 BR13	

Contents	
Topic	Sub-topic
Linear and nonlinear viscoelasticity	Ideal elastic and viscous behavior. Viscoelastic behavior of the materials. Range of linearity.
Choosing the most appropriate rheometer	Stress control rheometers. Deformation control rheometers. Geometric configurations. Parameters affecting the choice of the rheometer.
Experimental setup depending on the material	Geometric configurations. Stationary and dynamic tests. Determination of the ranges of linearity in frequency, amplitude and temperature. Choice and optimization of experimental parameters.

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A1 A2 B21 C6 C7	10	10	20
Laboratory practice	A1 B2 B8 B13	15	9	24
Supervised projects	A1 A2 B2 B4 B8 B13 B21 C2 C6	2.5	22.5	25
Objective test	A1 A2 B2 B4 B8 B13 C2	1	0	1
Personalized attention		5	0	5
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Guest lecture / keynote speech	Presentation given by the professor, on a schematic basis, focusing on the main topics, covering both theoretical and practical issues.
Laboratory practice	Performance of practical activities such as demonstrations, exercises, experiments, research, etc..
Supervised projects	Activities whose purpose is that the students enlarge the study of ther topics pesented in each theme and consolidate their acquired knowledge and capabilities. These activities should aslo help the students learn and improve their capabilities in literature survey.
Objective test	Exam that will help to evaluate the knowledge and competencies acquired by the students.

Personalized attention	
Methodologies	Description
Guest lecture / keynote speech Laboratory practice Supervised projects Objective test	The personalized attention to students, understood as a support in the teaching-learning process, will take place in the hours of tutoring of the teacher.

Assessment			
Methodologies	Competencies / Results	Description	**Qualification**
Guest lecture / keynote speech	A1 A2 B21 C6 C7	Continuous assessment through monitoring of student work in the classroom, laboratory and / or tutorials	10

Laboratory practice	A1 B2 B8 B13	Continuous assessment through monitoring of student work in the classroom, laboratory and / or tutorials	10
Supervised projects	A1 A2 B2 B4 B8 B13 B21 C2 C6	Activities whose purpose is that the students enlarge the study of ther topics pesented in each theme and consolidate their acquired knowledge and capabilities. These activities should also help the students learn and improve their capabilities in literature survey.	60
Objective test	A1 A2 B2 B4 B8 B13 C2	Examination or objective test.	20

Assessment comments

Sources of information	
Basic	O sistema de Biblioteca da UDC permite realizar búsquedas de literatura recomendada por profesor e material. Esta é unha lista ampliada das fontes recomendadas:Estudo reolóxico de betumes asfálticos [Recurso electrónico] / Jesús López Paz ; tutores Ramón Pedro Artiaga Díaz, Jorge José López Beceiro López Paz, Jesús Esc Politécnica Superior Depósito -- RP I 429 -- DISPOÑIBLE Understanding polymer processing : processes and governing equations Osswald, Tim A. Esc Politécnica Superior Depósito -- CM P 155 -- VENCE 05-06-15 Understanding rheology Morrison, Faith A. Esc Politécnica Superior Depósito -- CM 357 -- DISPOÑIBLE Thermal analysis. Fundamentals and applications to material characterization: proceedings of the international seminar: Thermal analysis and rheology. Ferrol, Spain, 30 Juny-4 July, 2003 / Ramón Artiaga Díaz (ed.), A Coruña: Universidade da Coruña, Servicio de Publicacions, 2005, ISBN 84-9749-100-9Thermal analysis of polymers / edited by Joseph D. Menczel, R. Bruce Prime; Hoboken, N.J.: John Wiley, [2009], ISBN 978-0-471-76917-0Menard, Kevin P., Dynamic mechanical analysis A practical introduction, Boca Raton : CRC Press, [1999], ISBN 0-8493-8688-8Ward, Ian Macmillan. An introduction to the mechanical properties of solid polymers / I.M. Ward, and J. Sweeney, Chischester, England : John Wiley & Sons, [2004] 2nd ed. ISBN 0-471-49625-1Relaxation phenomena in polymers / edited by Shiro Matsuoka. Munich ; New York : Hanser Publishers ; New York : Distributed in the U.S.A. and Canada by Oxford University Press, 1992. ISBN 3-446-17111-8 (Hanser), 0-19-520957-5 (Oxford University Press)
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.