Teaching Guide				
Identifying Data				2022/23
Subject (*)	Structured materials. Nanomaterials		Code	730495010
Study programme	Mestrado Universitario en Materiais Complexos: Análise Térmica e Reoloxía (plan 2012)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	1st four-month period	First	Obligatory	3
Language	English			
Teaching method	Face-to-face			
Prerequisites				
Department	Enxeñaría Naval e Industrial			
Coordinador	López Beceiro, Jorge José	E-mail	jorge.lopez.beceiro@udc.es	
Lecturers	Carn , Florent López Beceiro, Jorge José	E-mail	florent.carn@univ-paris-diderot.fr jorge.lopez.beceiro@udc.es	
Web				
General description	This subject introduces the latest strategies for structuring hard materials (nanoparticles, nanocomposites, porous monoliths hierarchically) by complex fluids. Complex fluids normally considered: solutions of large molecules (eg polymers) or supramolecular structures (eg, micelles ...) in ordinary liquids, foams or emulsions. The aim of this course is to illustrate the physical form of complex fluids and concepts that can be applied to the rational design of advanced materials. Emphasis will be placed for each system, in: the structure / properties of the final solid materials; the structure and stability of complex fluids and some specific characterization techniques are presented.			

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
A5	Understanding the relationships between structure and properties of materials
B1	Knowledge and understanding to provide a basis or opportunity for originality in developing and / or applying ideas, often in a research context
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
B13	Analysis-oriented attitude
B14	Ability to find and manage the information
B17	Analyze and decompose processes
B18	Ability for abstraction, understanding and simplification of complex problems
B21	To assess the importance of research, innovation and technological developments in the socio-economic and cultural progress of society
B22	Understand the importance of protecting the environment
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.
C8	To assess the importance of research, innovation and technological development in the socio-economic and cultural progress of society.

Learning outcomes	
Learning outcomes	Study programme competences / results

This course introduces recent strategies for structuring hard materials (nanoparticles, nanocomposites and hierarchically porous monoliths) by complex fluids. Complex fluids that are typically considered: solutions of large molecules (eg polymers.) Or supramolecular structures (eg micelles..) In ordinary liquids, foams or emulsions. The aim of this course is to illustrate how complex physical concepts of fluid can be applied to the rational design of advanced materials. For each system, the emphasis will be on: structure / properties of the final solid materials; the structure and stability of the complex fluids. Some specific characterization techniques presented.	AR1 AR5	BR1 BR2 BR4 BR13 BR14 BR17 BR18 BR21 BR22	CR2 CR6 CR7 CR8

Contents	
Topic	**Sub-topic**
1. Fundamentals of physicochemical Interfaces	Fundamentos físico químicos de interfases
2. Solid hierarchically porous	Sólidos xerárquicamente porosos
3. Nanoparticles	Nanopartículas
4. Nanocomposites	Materiais nanocompostos
5. Biogels	Bioxeles

Planning				
Methodologies / tests	**Competencies / Results**	**Teaching hours (in-person & virtual)**	**Student?s personal work hours**	**Total hours**
Guest lecture / keynote speech	A1 A5 B14	12.5	12.5	25
Laboratory practice	A1 B2 B17 B18 C8	20	4	24
Supervised projects	B1 B4 B13 B21 B22 C2 C6 C7	4	20	24
Personalized attention		2	0	2
(*)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, etc..
Supervised projects	Activities whose purpose is that the students enlarge the study of the topics pesented in the program and consolidate their acquired knowledge and capabilities. These activities should also help the students learn and improve their capabilities in literature survey.

Personalized attention	
Methodologies	**Description**
Guest lecture / keynote speech Laboratory practice Supervised projects	The personalized attention to students, understood as a support in the teaching-learning process, will take place in the hours of tutoring of the professor. No academic dispensation is accepted.

Assessment			
Methodologies	**Competencies / Results**	**Description**	**Qualification**
Guest lecture / keynote speech	A1 A5 B14	Continuous assessment through monitoring of student work in the classroom, laboratory and / or tutorials.	50

Laboratory practice	A1 B2 B17 B18 C8	Continuous assessment through monitoring of student work in the classroom, laboratory and / or tutorials.	20
Supervised projects	B1 B4 B13 B21 B22 C2 C6 C7	Presentation (oral and written) of the supervised work.	30

Assessment comments
No academic dispensation is accepted. The evaluation criteria for the second opportunity and the extraordinary opportunity are the same as for the first opportunity.

Sources of information	
Basic	
Complementary	- R.K. Iler (1979). The Chemistry of Silica. Wiley, New York - J.P. Jolivet (1994). De la solution à l?oxyde. C.N.R.S. Editions, E.D.P. Sciences, Paris - C. J. Brinker, G. W. Scherer (1990). Sol-Gel Science. Academic Press, San Diego

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
To help achieve a sustained immediate environment and meet the objective of action number 5: "Healthy and sustainable environmental and social teaching and research" of the "Green Campus Ferrol Action Plan:The delivery of the documentary work carried out in this subject:They will be requested in virtual format and/or computer supportIt will be done through Moodle, in digital format without the need to print them.If it is necessary to make them on paper:- Plastics shall not be used- Double-sided printing shall be carried out.- Recycled paper will be used.- Printing of drafts shall be avoided.- A sustainable use of resources and the prevention of negative impacts on the natural environment must be made.- It will work to identify and change gender biases and attitudes, and influence the environment to change them and promote values of respect and equality.- Situations of discrimination should be identified and actions and measures proposed to correct them.