Teaching Guide				
Identifying Data				2022/23
Subject (*)	Applications of Nanomaterials and New Materials		Code	610509316
Study programme	Mestrado Universitario en Investigación Química e Química Industrial (Plan 2020)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	2nd four-month period	First	Optional	3
Language	SpanishGalicianEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	Departamento profesorado másterQuímica			
Coordinador	Castro Garcia, Socorro	E-mail	socorro.castro.garcia@udc.es	
Lecturers	Castro Garcia, Socorro Moreda Piñeiro, Antonio	E-mail	socorro.castro.garcia@udc.es	
Web	(na USC) www.usc.gal/es/estudios/masteres/ciencias/master-universitario-investigacion-quimica-quimica-industrial-2a-ed/20222023/			
General description	This course aims to provide an overview of the applications of nanomaterials and new materials, relating the rest of the subjects in this module to each other and contextualizing the most important aspects of them. It will also put in context and relate nanomaterials and new materials with the rest of disciplines with which it interacts, given that their study only makes sense in an interdisciplinary context, understanding that their purpose is the understanding and development of nanomaterials and new materials to optimize and achieve new properties, so that they can be applied in fields as varied as biomedicine, electronics, optics, energy, catalysis, food, cosmetics, textiles, environment, engineering, etc.			

Study programme competences / results	
Code	Study programme competences / results
A1	Define concepts, principles, theories and specialized facts of different areas of chemistry.
A4	Apply materials and biomolecules in innovative fields of industry and chemical engineering.
A9	Promote innovation and entrepreneurship in the chemical industry and in research.
B1	Possess knowledge and understanding to provide a basis or opportunity for originality in developing and / or applying ideas, often within a research context
B2	Students should apply their knowledge and ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study.
B4	Students should be able to communicate their conclusions, and the knowledge and the reasons that support them to specialists and non-specialists in a clear and unambiguous manner
B6	Innovate in the different areas of chemistry, demonstrating initiative and entrepreneurship
B7	Identify information from scientific literature by using appropriate channels and integrate such information to raise and contextualize a research topic
B10	Use of scientific terminology in English to explain the experimental results in the context of the chemical profession
C1	CT1 - Elaborar, escribir e defender publicamente informes de carácter científico e técnico
C3	CT3 - Traballar con autonomía e eficiencia na práctica diaria da investigación ou da actividade profesional.
C4	CT4 - Apreciar o valor da calidade e mellora continua, actuando con rigor, responsabilidade e ética profesional.

Learning outcomes	
Learning outcomes	Study programme competences / results

The student will acquire an overview of the most relevant and current applications of Nanomaterials and New Materials, their main areas of activity, achievements, limitations, goals and future prospects. The student will know the main strategies for the search, design and developing of Nanomaterials and New Materials. The student will understand the relationships between composition-structure-microstructure-bonds-properties and applications of Nanomaterials and New Materials. The student will obtain an overview of the new trends in synthetic methodologies, characterization and reactivity of Nanomaterials and New Materials.	AC1 AC4 AC9	BC1 BC2 BC4 BC6 BC7 BC10	CC1 CC3 CC4

Contents	
Topic	**Sub-topic**
Unit I	- Introduction. Trends in Nanomaterials and New Materials. - Classification of Nanomaterials and New Materials. - Challenges in Nanomaterials and New Materials - Applications of Nanomaterials and New Materials in the context of current perspectives in Research and Industry.
Unit II	- Applications of Nanomaterials and New Materials: - Applications in Biomedicine. - Applications in electronics, optoelectronics and photonics. - Applications in energy. - Heterogeneous catalysis applications. - Applications in food, cosmetics and textiles. - Environmental applications. - Structural applications. - Applications in art and other trends.

Planning				
Methodologies / tests	**Competencies / Results**	**Teaching hours (in-person & virtual)**	**Student?s personal work hours**	**Total hours**
Guest lecture / keynote speech	A1 A4 A9 B1 C4	12	0	12
Seminar	B2 B4 B6 B7 B10 C1	7	0	7
Supervised projects	A1 C1 C3 C4	2	0	2
Problem solving	B2 C1 C3	0	18	18
Document analysis	B7 B10 C3	0	20	20
Objective test	A1 A4 B1 B2 B4 B10 C4	1	15	16
Personalized attention		0	0	0
(*)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	Interactive lectures by the teacher, with active participation of the students.
Seminar	Seminars with master's or guest professors, from other institutions, as well as with experts in the field. They will be interactive sessions.
Supervised projects	Individual or small group tutoring.
Problem solving	Solution to problems or development of short projects, proposed by the teacher, or by the student himself (if deemed appropriate).
Document analysis	Personal study based on the different sources of information.
Objective test	One or several tests for the verification of the acquisition of knowledge and acquisition of the skills and attitudes proposed for this subject.

Personalized attention	
Methodologies	**Description**
Objective test Problem solving	Individual or group tutoring.

Assessment			
Methodologies	**Competencies / Results**	**Description**	**Qualification**
Objective test	A1 A4 B1 B2 B4 B10 C4	55% of the overall rating	60
Problem solving	B2 C1 C3	LECTURES, SEMINARS, PROBLEM SOLVING: compute together (45% of the overall rating)	40
Guest lecture / keynote speech	A1 A4 A9 B1 C4	LECTURES, SEMINARS, PROBLEM SOLVING: compute together (45% of the overall rating)	0
Seminar	B2 B4 B6 B7 B10 C1	LECTURES, SEMINARS, PROBLEM SOLVING: compute together (45% of the overall rating)	0

Assessment comments
The evaluation of this subject will be done through continuous assessment and a final exam. Access to the exam is conditioned to the participation in at least 80% of the compulsory attendance teaching activities (theoretical classes, seminars and tutorials). The teacher will verify class attendance according to the official attendance control system established in each Centre or University. Absences must be justified by documentation. Justified absences will count as attendance at teaching activities, for the purposes of being able to take the exam. If the continuous evaluation is not passed, a final exam must be taken, which will count for 100% of the overall grade. The second opportunity will consist of a final exam, which will count for 100% of the overall grade. Indication referring to plagiarism and the improper use of technology in the performance of tasks or tests: "In cases of fraudulent performance of exercises or tests, the provisions of the Regulations on the Evaluation of Students' Academic Performance and the Review of Grades shall apply".

Sources of information	
Basic	- D. Vollath: "Nanomaterials: an introduction to synthesis, properties and applications". Wiley-VCH, 2013.- G. Cao: "Nanostructures and Nanomaterials: Synthesis, Properties and Applications". Imperial College Press, 2004. - A.R. West: "Solid State Chemistry and its Applications". Wiley, 2014. - R. Tilley: "Understanding solids: the science of materials". Wiley, 2004.- L.E. Smart, E.A. Moore: "Solid State Chemistry: An Introduction". CRCPress, 2012. - J.A. Schwarz, C.I. Contescu, K. Putyera (Editores): "Dekker Encyclopedia of nanoscience and nanotechnology" (5 vols.). Marcel Dekker, 2004. - D. Vollath: "Nanomaterials: an introduction to synthesis, properties and applications". Wiley-VCH, 2013.- G. Cao: "Nanostructures and Nanomaterials: Synthesis, Properties and Applications". Imperial College Press, 2004. - A.R. West: "Solid State Chemistry and its Applications". Wiley, 2014. - R. Tilley: "Understanding solids: the science of materials". Wiley, 2004.- L.E. Smart, E.A. Moore: "Solid State Chemistry: An Introduction". CRCPress, 2012. - J.A. Schwarz, C.I. Contescu, K. Putyera (Editores): "Dekker Encyclopedia of nanoscience and nanotechnology" (5 vols.). Marcel Dekker, 2004.

Complementary	High-impact journals in the fields of"nanomaterials" and "new materials" accessible throughuniversity libraries (Nature Review Materials, Nature Materials, NatureNanotechnology, Advanced Materials, Materials Today, Nano Today, etc.)In addition, complementary texts(articles, web pages, specific texts) will be recommended for each subject whenthe course is taught.High-impact journals in the fields of"nanomaterials" and "new materials" accessible throughuniversity libraries (Nature Review Materials, Nature Materials, NatureNanotechnology, Advanced Materials, Materials Today, Nano Today, etc.)In addition, complementary texts(articles, web pages, specific texts) will be recommended for each subject whenthe course is taught.

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.