



## IDENTIFYING DATA

### Materials chemistry

Subject	Materials chemistry			
Code	V11G200V01702			
Study programme	(*)Grao en Química			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	4th	1st
Teaching language	Spanish Galician English			
Department				
Coordinator	Valencia Matarranz, Laura María			
Lecturers	Pastoriza Santos, Isabel Pérez Lourido, Paulo Antonio Valencia Matarranz, Laura María			
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Web				
General description	Structure, properties and application of the different types of materials.			

## Competencies

Code	
C5	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: Characteristics of the different states of matter and the theories used to describe them
C8	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: main techniques for structural determination, including spectroscopy
C18	Demonstrate knowledge and understanding of essential facts, concepts, principles and theories: principles of electrochemistry
C19	Apply knowledge and understanding to solve basic problems of quantitative and qualitative nature
C20	Evaluate, interpret and synthesize data and chemical information
C23	Present oral and written scientific material and scientific arguments to a specialized audience
D1	Communicate orally and in writing in at least one of the official languages of the University
D3	Learn independently
D4	Search and manage information from different sources
D5	Use information and communication technologies and manage basic computer tools
D7	Apply theoretical knowledge in practice
D8	Teamwork
D9	Work independently
D12	Plan and manage time properly
D13	Make decisions
D14	Analyze and synthesize information and draw conclusions
D15	Evaluate critically and constructively the environment and oneself

## Learning outcomes

Expected results from this subject	Training and Learning Results	
Recognise the differences between the plastic and elastic deformation.	C5 C19 C20	D1 D9
Analyse the characteristics of metals and alloys through essays of traction and compression.	C5 C19 C20	D1 D7 D9

Differentiate between electrical and ionic conductivity. Distinguish the intrinsic semiconductors of the extrinsic.	C5 C19 C20	D1 D7 D9
Differentiate between the cooperative magnetism and the no cooperative.	C5 C19 C20	D1 D9
Recognise hard magnetic materials and soft from his cycle of histéresis.	C5 C19 C20	D1 D9
Recognise the types of superconductivity and his relation with the nature of the material.	C5 C19 C20	D1 D9
Describe the optical properties of the metals and no metals.	C5 C19	D1 D9
Describe the applications of the optical phenomena more important.	C5 C19	D1 D9
Explain the thermal properties more important of the materials.	C5 C19 C20	D1 D9
Analyse and describe the characteristics of the alloys in function of his diagrams of phases.	C5 C19 C20	D1 D7 D9 D12 D13 D14
Describe the properties of the different ceramic materials and polymers.	C5 C20	D1 D7 D9
Describe the general characteristics of the compound materials.	C20 C23	D1 D3 D4 D5 D8 D12 D14 D15
Analyse the corrosion of metals and ceramic and the degradation of the polymers.	C18	D1 D8 D14
Justify and enter the need of new materials and nanomaterials.	C20 C23	D1 D3 D4 D5 D8 D12 D14 D15
Describe the basic processes for the obtaining of nanomaterials.	C5 C20 C23	D1 D3 D4 D7 D8 D9 D13 D15
Tackle the basic technicians of study of the surfaces of the materials.	C8 C23	D1 D3 D4 D5 D8 D12 D14 D15

## Contents

Topic

Subject 1. Introduction	Historical perspective of the development of the materials. Relation between structure and properties. Classification of the materials. Need of new materials.
Subject 2. Properties of the materials: mechanics, electrical, magnetic, optical and thermal.	Mechanical properties: elastic and plastic deformation. Ductility, resilience and tenacity. Hardness. Mechanisms of dislocation. Systems of slide. Fracture and fatigue. Electrical properties: electrical conductivity. Semiconductors. Driving in ceramics and polymers. Ionic conductivity. Dielectric behaviour. Ferroelectricity and piezoelectricity. Magnetic properties. Cooperative magnetism: ferromagnetism. Ferromagnetic commands. Cycles of histéresis. Anti- and ferrimagnetism. Superconductivity. Optical properties. Luminescence. Lasers. Optical fibres. Thermal properties. Calorific capacity. Thermal dilatation. Thermal conductivity. Thermal tensions.
Subject 3. Metallic materials and alloys.	Diagrams of phase. Thermal treatment of the metallic alloys. ferric Alloys. Steels. No-Ferric Alloys. Alloys with memory of form.
Subject 4. Ceramic materials.	Usual structures. Silicates. Carbon. Imperfections. Glasses. Clays. Refractory.
Subject 5. Material polymers.	Structures of the polymers. Mechanical and thermomechanical characteristics. Thermoplastic and thermostable polymers. Applications and forming of the polymers.
Subject 6. Compound materials.	General characteristics. Classification. Materials reinforced with: particles, fibres and structural compounds.
Subject 7. Degradation of materials.	Metallic oxidation and passivation. Methods of protection against the corrosion. Methods of self-reparation.
Subject 8. New materials and nanomaterials.	Nanoscience and nanotechnology. Methods of preparation. Properties to nanoscale.
Subject 9. Characterisation of materials.	Electronic microscopy, fotoelectrónica spectroscopy.

## Planning

	Class hours	Hours outside the classroom	Total hours
Master Session	26	45	71
Seminars	13	32	45
Short answer tests	4	30	34

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

## Methodologies

	Description
Master Session	The students will receive 26 hours of magistral classes in an only group, that will devote to the presentation of the fundamental appearances of each subject. The platform of "teledocencia" will use to provide the supplementary material related with the matter.
Seminars	They will devote to the resolution of doubts or questions that arise in the development of each subject, to the exhibition by part of the students of subjects related with the matter, as well as to the resolution of exercises and exposed problems by the professor.

## Personalized attention

Methodologies	Description
Seminars	During all the educational period the students will be able to consult all type of doubts related with the matter in the tutorial hours.

## Assessment

Description	Qualification	Training and Learning Results

Seminars	In addition to resolving practical exercises that allow to the students settle the knowledges on the subjects developed in the classes of theory, and to resolve all the exposed doubts, the classes of seminar will use also to carry out to continuous evaluation of the students.	40	C5 C8 C19 C20 C23	D1 D3 D4 D5 D7
	This process of continuous evaluation will realise through the resolution of exercises and/or problems related with the contents of the matter, as well as the resolution of exposed short questions by the professor that the students will have to deliver for his evaluation.			D8 D9 D12 D13 D14 D15
	Also will carry out by means of the preparation and exhibition by part of the students of subjects related with the matter.			
Short answer tests	Along the cuatrimestre will realise two short proofs for the evaluation of the competitions purchased in the matter.	60	C5 C8	D1 D7
	The first of them will cover the subjects 1-5 and will suppose 36% of the final note.		C18	D12
	The second will cover the subjects 6-9 and will suppose 24% of the final note. To surpass the matter is necessary to reach a minimum of 40% in each one of the short proofs.		C19 C20	D13

### Other comments on the Evaluation

Observations: it is compulsory the assistance to all the planned activities that carry evaluation. The participation in 20% of the activities of evaluation of the seminars along the cuatrimestre, or in any of the short proofs of planned evaluation, will involve the condition of presented and thus, the qualification in the record of the matter. It will be necessary to surpass the two short proofs (obtain a minimum of 40% of the note of each one) to be able to take into account the other elements of evaluation.

July Evaluation: the students that do not surpass one or the two short proofs that realise during the cuatrimestre, will have to present to the corresponding part in the announcement of Julio. This proof will substitute to the results obtained in the tests shorts realised along the cuatrimestre. They will keep the note of the remaining elements of evaluation of the cuatrimestre.

### Sources of information

#### Basic Bibliography

#### Complementary Bibliography

Callister, W.D., Rethwisch, D.G., **Materials Science and Engineering**, Wiley,  
Callister, W.D., Rethwisch, D.G., **Introducción a la Ciencia e Ingeniería de los Materiales**, Reverté (trad. 9ªed),  
Kirkland, A.I., Hutchison, J.L., **Nanocharacterisation**, RSC, Cambridge,  
Levine, I.N., **Fisicoquímica**, McGraw-Hill / Interamericana de España, S. A.,  
Singh, S. C., Hoboken J., **Nanomaterials**, John Wiley & Sons,  
Smart, L.E. Moore, E.A., **Solid State Chemistry. An introduction**, Taylor & Francis, 4ªed,  
Vollath, D., **Nanomaterials : an introduction to synthesis, properties and application**, Wiley-VCH,  
West, A.R., **West, A.R.. Solid state chemistry and its applications**, John Wiley & Sons.,

### Recommendations

#### Subjects that are recommended to be taken simultaneously

Inorganic chemistry III/V11G200V01703

#### Subjects that it is recommended to have taken before

Physical chemistry III/V11G200V01603