



## IDENTIFYING DATA

### Materials science and technology

Subject	Materials science and technology			
Code	V12G380V01301			
Study programme	Degree in Mechanical Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Figueroa Martínez, Raúl Abreu Fernández, Carmen María			
Lecturers	Abreu Fernández, Carmen María Álvarez Dacosta, Pedro Cortes Redin, María Begoña Díaz Fernández, Belén Figueroa Martínez, Raúl Iglesias Rodríguez, Fernando Pena Uris, Gloria María Riobó Coya, Cristina			
E-mail	cabreu@uvigo.es raulfm@uvigo.es			
Web	<a href="http://fatic.uvigo.es">http://fatic.uvigo.es</a>			
General description	The aim that pursues with this subject is to initiate to the student in the Science and Technology of the Materials and his applications in the Engineering.			

## Competencies

Code	
B3	CG3 Knowledge in basic and technological subjects that will enable students to learn new methods and theories, and provide them the versatility to adapt to new situations.
B4	CG4 Ability to solve problems with initiative, decision making, creativity, critical thinking and the ability to communicate and transmit knowledge and skills in the field of industrial engineering in Mechanical specialty.
B6	CG6 Capacity for handling specifications, regulations and mandatory standards.
C9	CE9 Knowledge of the fundamentals of the science, technology and chemistry of materials. Understand the relationship between microstructure, the synthesis, processing and properties of materials.
D1	CT1 Analysis and synthesis
D5	CT5 Information Management.
D9	CT9 Apply knowledge.
D10	CT10 Self learning and work.

## Learning outcomes

Expected results from this subject	Training and Learning Results		
It comprises the fundamental concepts of link, structure and microstructure of the distinct types of materials	B3	C9	D10
It comprises the relation go in to microstructure of the material in his mechanical behaviour, electrical, thermal and magnetic	B3	C9	
It comprises the mechanical behaviour of the metallic materials, ceramic, plastics and compound	B4 B6		
It knows how they can modify the properties by means of mechanical processes and thermal treatments	B4	C9	D9
It knows the basic technicians of structural characterisation of the materials	B3 B6	C9	

It purchases skills in the handle of the diagrams and charts			D1 D5
It purchases skill in the realisation of essays	B6	C9	D10
It analyses the results obtained and extracts conclusions of the same			D1 D9
It is able to apply norms of essays of materials	B6		D1 D9

## Contents

Topic	
Introduction	Introduction to the Science and Technology of Material. Classification of the materials. Terminology. Orientations for the follow-up of the matter.
Crystalline arrangement.	Crystalline and amorphous solids. Crystalline lattices, characteristics and imperfections. Allotropic transformations.
Properties of materials. Laboratory practices.	Mechanical, chemical, thermal, electric and magnetic properties. Standards for materials analysis. Compressive and tensile deformation. Principles of fracture mechanisms. Toughness. Hardness. Main test methods. Fundamentals of thermal analysis. Fundamentals of non-destructive testing. Introduction to metallography. Binary isomorphous and eutectic systems. Microstructure in eutectic alloys. Analyses of practical situations.
Metallic materials.	Solidification. Constitution of alloys. Grain size. Main binary phase diagrams. Processing. Carbon steels: classification and applications. Cast iron alloys. Heat treatments: annealing, normalizing, quenching and tempering. Nonferrous alloys.
Polymers and composites	General concepts. Classification. Properties. Types of polymers. Processing. Classification of composite materials. Polymer matrix composite materials. Processing of composite materials. Problems related to polymeric and composite materials.
Ceramic materials	Structure and bonding in ceramic materials. Silicates structure. Glasses. Properties of ceramic materials. Processing of ceramic materials. Applications.

## Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	1.5	0	1.5
Lecturing	31	55.8	86.8
Laboratory practical	18	18	36
Autonomous problem solving	0	12	12
Objective questions exam	0.5	0.5	1
Problem and/or exercise solving	1	0.95	1.95
Problem and/or exercise solving	1.25	3	4.25
Essay	0.5	6	6.5

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

## Methodologies

	Description
Introductory activities	Presentation of the subject. Introduction to the science and Technology of Materials
Lecturing	Exhibition by part of the professor of the contents on the matter object of study, of the bases and/or guidelines of the work /exercise/ project to develop by the student. Use of manipulative Activities or experiences of chairs
Laboratory practical	Application to practical level of the theory in the field of the knowledge of Science and Technology of materials
Autonomous problem solving	The student has to be able to develop the capacity to resolve problems and/or exercises of autonomous form.

## Personalized assistance

Methodologies	Description
Lecturing	The professor, in his schedule of tutorials, will clear the doubts that can have the student.
Laboratory practical	The professor, in his schedule of tutorials, will clear the doubts that can have the student.
Tests	Description
Problem and/or exercise solving	The professor, in his schedule of tutorials, will clear the doubts that can have the student.
Essay	The professor, in his schedule of tutorials, will clear the doubts that can have the student.

Assessment					
	Description	Qualification	Training and Learning Results		
Laboratory practical	<p>Assistance, participation and reports that delivered periodically.</p> <p>Results of learning:            it Comprises the mechanical behaviour of the metallic materials, ceramic, plastics and compounds            Knows the basic technicians of structural characterisation of the materials            Purchases skills in the handle of the diagrams and charts.            It is able to apply norms of essays of materials            Purchases skill in the realisation of essays.            It analyses the results obtained and extracts conclusions of the same</p>	2	B3 B6	C9	D1 D5 D9 D10
Problem and/or exercise solving	<p>In the final examination will include questions of short answer and/or type test. The examination will realise in the date fixed by the centre.</p> <p>Results of learning:            it Comprises the fundamental concepts of link, structure and microestructure of the distinct types of materials.            It comprises the relation go in to microestructure of the material in his mechanical behaviour, electrical, thermal and magnetic.            It comprises the mechanical behaviour of the metallic materials, ceramic, plastics and composed            Know how can modify the properties by means of mechanical processes and thermal treatments            Knows the basic technicians of structural characterisation of the materials            Purchases skills in the handle of the diagrams and charts            Is able to apply norms of essays of materials            Purchases skill in the realisation of essays            Analyses the results obtained and extracts conclusions of the same</p>	43	B3 B4 B6	C9	D1 D5 D9 D10
Problem and/or exercise solving	<p>It will value the exercises posed along the course (25%).            In the final examination will include similar exercises (20%).</p> <p>Results of learning:            it Comprises the fundamental concepts of link, structure and microestructure of the distinct types of materials.            It comprises the relation go in to microestructure of the material in his mechanical behaviour, electrical, thermal and magnetic.            It comprises the mechanical behaviour of the metallic materials, ceramic, plastics and composed            Know how can modify the properties by means of mechanical processes and thermal treatments            Knows the basic technicians of structural characterisation of the materials            Purchases skills in the handle of the diagrams and charts            Is able to apply norms of essays of materials            Purchases skill in the realisation of essays            Analyses the results obtained and extracts conclusions of the same</p>	50	B3 B4 B6	C9	D1 D5 D9 D10
Essay	<p>They posed works along the course and will indicate the guidelines for his preparation.</p> <p>Results of learning:            it Comprises the fundamental concepts of link, structure and microestructure of the distinct types of materials.            It comprises the relation go in to microestructure of the material in his mechanical behaviour, electrical, thermal and magnetic.            It comprises the mechanical behaviour of the metallic materials, ceramic, plastics and composed            Know how can modify the properties by means of mechanical processes and thermal treatments            Knows the basic technicians of structural characterisation of the materials            Purchases skills in the handle of the diagrams and charts            Is able to apply norms of essays of materials            Purchases skill in the realisation of essays            Analyses the results obtained and extracts conclusions of the same</p>	5	B3 B4 B6	C9	D1 D5 D9 D10

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## Other comments on the Evaluation

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### Evaluación Continua

The *evaluación continua* make during the period of *impartición* of the subject, *según* los criterios establecidos in the previous section and corresponds with 30% of the final note. To surpass the subject be necessary to have reached *una puntuación mínima* of 40% in the proof made in the date previously *fijada* por the centre, that corresponds with 70% of the final note. Those students *queno* receive to the *evaluación continua* (previous *autorización* of the *dirección de EEI*) be evaluated with a final examination on the contents of *la totalidad* of the matter, that *supondrá* 100% of the note.

### Examination of Julio (2ª Edición)

In the examination *de julio* *tendrá* in account the *evaluación continua* (Válida only in the course 2019-20). The examination *tendrá* the same *características* que the previous and make in the previously fixed date by the centre. Those students *que quieran* renounce to the *evaluación continua* be evaluated with an examination *final* sobre the contents of the whole of the material (*teoría + práctica*) *que supondrá* 100% of the note.

### Extraordinary examination

Examination on *los contenidos* of the whole of the material (*teoría + práctica*) that *supondrá* 100% of the note.

### Commitment Ético:

It expects that the present student a behaviour *ético* suitable. In *caso* de detect a behaviour no *ético* (copy, plagiarism, *utilización* of *aparatos electrónicos* unauthorised, etc.), consider that the student no *reñe* *los requisitos* necessary to surpass the matter. In this case, the *calificación global* in the present course *académico* be of suspense (0.0).

No allow the *utilización* of *ningún* device *electrónico* *durante* las proofs of *evaluación*, except *autorización* expresses. The fact of *introducir* un device *electrónico* unauthorised in the classroom of examination be *considerado* motivo of no *superación* of the matter in the present course *académico* and *la calificación global* be of suspense (0.0).

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## Sources of information

### Basic Bibliography

Callister, William, **Materials Science and Engineering: an introduction**, Wiley,  
Askeland, Donald R, **The science and engineering of materials**, Cengage Learning,  
Shackelford, James F, **Introduction to materials science for engineers**, Prentice-Hall,

### Complementary Bibliography

Smith, William F, **Fundamentals of materials science and engineering**, McGraw-Hill,  
AENOR, **Standard tests**,  
Montes J.M., Cuevas F.G., Cintas J., **Ciencia e Ingeniería de Materiales**, Paraninfo,

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## Recommendations

### Subjects that continue the syllabus

Materials engineering/V12G380V01504

### Subjects that are recommended to be taken simultaneously

Fundamentals of manufacturing systems and technologies/V12G380V01305  
Fluid mechanics/V12G380V01405  
Thermodynamics and heat transfer/V12G380V01302

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

Computer science: Computing for engineering/V12G350V01203  
Physics: Physics I/V12G380V01102  
Physics: Physics II/V12G380V01202  
Mathematics: Algebra and statistics/V12G380V01103  
Mathematics: Calculus I/V12G380V01104  
Chemistry: Chemistry/V12G380V01205

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## Other comments

To enrol in this matter is necessary to have surpassed or enrol of all the subjects of the inferior courses to the course in that

it is situated this matter.

In case of discrepancy in the information contained in this guide will understand that it prevails the version edited in Spanish.

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