



## IDENTIFYING DATA

### Materials science and technology

Subject	Materials science and technology			
Code	V12G360V01301			
Study programme	Degree in Industrial Technologies Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	Spanish Galician			
Department	Materials Engineering, Applied Mechanics and Construction			
Coordinator	Pena Uris, Gloria María Abreu Fernández, Carmen María			
Lecturers	Abreu Fernández, Carmen María Cortes Redin, María Begoña Díaz Fernández, Belén Figueroa Martínez, Raúl Iglesias Rodríguez, Fernando Pena Uris, Gloria María			
E-mail	cabreu@uvigo.es gpena@uvigo.es			
Web	<a href="http://fatic.uvigo.es">http://fatic.uvigo.es</a>			
General description	The aim of this subject is to introduce the main concepts of materials technology as well as to study applications of the most common materials			

## Competencies

Code	
B3	CG3 Knowledge in basic and technological subjects that will enable them to learn new methods and theories, and equip them with versatility to adapt to new situations.
B4	CG4 Ability to solve problems with initiative, decision making, creativity, critical thinking and to communicate and transmit knowledge, skills and abilities in the field of Industrial Engineering.
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 influence of the microstructure of the material on its mechanical , electrical, thermal and magnetic behaviour	B3	C9	
It comprises the mechanical behaviour of the metallic, ceramic, plastics and composite materials.	B4 B6		
It knows how to modify the material properties by means of mechanical processes and thermal treatments	B4	C9	D9
It knows the basic structural characterisation techniques for materials.	B3 B6	C9	
To acquire skills in the handle of the diagrams and charts			D1

To acquire skills in the realisation of tests	B6	C9	D10
It analyses the results obtained and extracts conclusions from them			D1 D5 D9
It is able to apply norms of materials testing	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: ims, fundamentals and classification. Annealing, normalizing, quenching and tempering. Nonferreous 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 practices	18	18	36
Autonomous problem solving	0	12	12
Objective questions exam	0.5	0.5	1
Short answer tests	1	0.95	1.95
Problem solving	1.25	1.5	2.75
Essay	0.5	7.5	8

\*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 materials science and technology.
Lecturing	Exhibition by the lecturers of the main contents of the subject, theoretical bases and/or projects guidelines. Hands on science methodology.
Laboratory practices	Practical application of the theoretical contents. Practical exercises in the materials laboratory.
Autonomous problem solving	Formulation of a practical activity related to the subject. The student must be able to resolve them by himself.

## Personalized attention

Methodologies	Description
Lecturing	
Laboratory practices	
Tests	Description
Problem solving	
Essay	

## Assessment

Description		Qualification Training and Learning Results			
Laboratory practices	Attendance, participation and periodical assignments.	2	B3 B6	C9	D1 D9 D10
Short answer tests	In the final exam, short questions will be included. The final exam will be held the day fixed by the school.	40	B3 B4 B6	C9	D1 D9 D10
Problem solving	Exercises will be assessed along the course (25%). The final exam will include similar exercises (20%).	50	B3 B4 B6	C9	D1 D9 D10
Essay	The main guidelines to successfully develop short projects will be given.	8	B3 B4 B6	C9	D1 D9 D10

#### Other comments on the Evaluation

<p><p>Continuous assessment</p>

<p><p>Continuous assessment will be done along the academic quadmester, following the methodologies described in the previous section. In order to pass the subject a minimum mark in the official exam&nbsp;must be reached (40%).

Check the date in the website <a href=&quot;http://eei.uvigo.es&quot;>http://eei.uvigo.es</a></p>

<p><p>Those students, who have resigned the continuous assessment option, will have the chance to get 10 points in the final exam.&nbsp;</p>

<p><p>Second Call (July)</p>

<p><p>The continuous assessment will not be taken into account for the second call in July.</p>

#### 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,

#### 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