



## IDENTIFYING DATA

### Materials and their properties: from macro to nano

Subject	Materials and their properties: from macro to nano			
Code	V11M188V01102			
Study programme	Máster Universitario en Nanociencia y Nanotecnología			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Mandatory	1st	1st
Teaching language	English			
Department				
Coordinator	Salgueiriño Maceira, Verónica Pastoriza Santos, Isabel			
Lecturers	Hervés Beloso, Juan Pablo Núñez Sánchez, Sara Pastoriza Santos, Isabel Rivas Murias, Beatriz Salgueiriño Maceira, Verónica			
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General description				

## Training and Learning Results

Code	
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### Expected results from this subject

Expected results from this subject	Training and Learning Results
Comprise the import of the internal structure of a material in his properties	
Understand how change the properties in function of the size	
Comprise the basic concepts related with the electrical properties, magnetic, optical and of transport of the nanomaterials.	

## Contents

Topic	
Introduction to the types of materials	Types of materials
Crystalline structure and diffraction	Diffraction of X-rays and Raman spectroscopy Ionic, covalent and metallic bonds. Quantization of energy.
Classical and quantum models of the metallic behaviour	Electrical and thermal conductivity. Specific heat. Implications at the nanoscale
Superconductivity, Ferroelectricity and Magnetism at the nanoscale	Superconductivity, Ferroelectricity and Magnetism at the nanoscale
Optical properties of materials	General appearances. Optical properties of metallic and semiconductors nanoscale materials

## Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	10	20	30
Seminars	8	16	24
Laboratory practical	6	12	18
Objective questions exam	2	1	3

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

### Methodologies

	Description
Lecturing	Theoretical class with participation of students
Seminars	Discussion of practical cases and resolution of problems
Laboratory practical	Practices of laboratory

### Personalized assistance

Methodologies	Description
Lecturing	
Seminars	
Laboratory practical	

### Assessment

	Description	Qualification	Training and Learning Results
Seminars	(*)Entregables	40	
Objective questions exam	(*)Examen de preguntas objetivas	60	

### Other comments on the Evaluation

### Sources of information

#### Basic Bibliography

P. A. Cox, **The electronic structure and chemistry of solids**, Oxford University Press, 2005

S. Elliott, **The physics and chemistry of solids**, Wiley and Sons, 2008

E. Smith and G. Dent, **Raman Spectroscopy**, Wiley and Sons, 2005

J. Singleton, **Band Theory and Electronic properties of solid**, Oxford Master Series, 2001

#### Complementary Bibliography

### Recommendations

#### Subjects that continue the syllabus

Master's Thesis/V11M188V01208

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

Nanomagnetism: Concepts, materials and applications/V11M188V01109

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

Introduction to Nanoscience and Nanotechnology/V11M188V01101