Teaching Guide				
Identifying Data				2019/20
Subject (*)	Material Properties		Code	610509122
Study programme	Mestrado Universitario en Investigación Química e Química Industrial (Plan 2017)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	Yearly	First	Optional	3
Language	Galician			
Teaching method	Face-to-face			
Prerequisites				
Department	Química			
Coordinador	Sanchez Andujar, Manuel	E-mail	m.andujar@udc.es	
Lecturers	Sanchez Andujar, Manuel	E-mail	m.andujar@udc.es	
Web				
General description	This subject is important in the module Nanochemistry and New materials, where it will reported the theoretical foundation of many of the fundamental properties of materials, which will be studied in other subjects of this module.			

Study programme competences	
Code	Study programme competences
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
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
B5	Students must possess learning skills to allow them to continue studying in a way that will have to be largely self-directed or autonomous.
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
B11	Apply correctly the new technologies to gather and organize the information to solve problems in the professional activity.
B12	Being able to work in a team and adapt to multidisciplinary teams.
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		
Understanding the fundamental aspects of the theory of solid, in relation to electronic structure and lattice.	AC1 AC4	BC1 BC5 BC7 BC10 BC11 BC12	CC3 CC4

Use the existing relations between the fundamental aspects of the theory and the different electronic properties and network with the experimental findings.	AC9	BC1 BC4 BC5 BC7 BC11 BC12	CC1 CC3
Understanding the influence of the dimensionality of the system on these properties.	AC1 AC4	BC1 BC4 BC5 BC7 BC12	CC1 CC3 CC4

Contents	
Topic	**Sub-topic**
Topic 1.- Classic and quantum models of free electrons.	Drude model and Sommerfeld model O modelo de Drude e o modelo de Sommerfeld Effect of periodic potential in the properties of the electron gas
Topic 2.- Quantization of lattice vibrations	Phonons
Topic 3.- Experimental techniques to determining the properties of electrical and thermal transport.	Electrical conductivity, thermal conductivity, thermoelectric power and Hall effect.
Topic 4.-Cooperative phenomena in insulatings.	Ferroelectricity and localised magnetism.
Tema 5.- Optical properties of matter	General trends. Optical properties of metals and semiconductors.

Planning				
Methodologies / tests	**Competencies**	**Ordinary class hours**	**Student?s personal work hours**	**Total hours**
Seminar	A1 A4 A9 B1 B4 B7 C3 C4	4	12	16
Supervised projects	A1 A4 B4 B5 B7 B10 B11 B12 C1 C3	1	6	7
Mixed objective/subjective test	A1 A4 A9 B1 B4 B5 B7 B10 B11 B12 C1 C3 C4	1	6	7
Guest lecture / keynote speech	A1 A9 C1	15	30	45
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**
Seminar	Practical lessons in which it proposes and solves problems, exercises, etc. The student participates actively in different ways: delivery of exercises to the teacher, exhibition of work, practical classes, etc. Attendance to these lessons are mandatory.
Supervised projects	The student will perform the exposure of previously proposed work. The schedule will be agreed with the students.
Mixed objective/subjective test	Final test to help assess the level of knowledge and skills acquired by students.
Guest lecture / keynote speech	Lesson taught by the teacher who may have different formats (theory, problems and / or general examples, general guidelines on the matter ...). The teacher may have the support of audiovisual and computer media.

Personalized attention

Methodologies	Description
Seminar Supervised projects	All students must participate in an active way in these activities, so that teachers can check if the students are acquiring the skills of this subject.

Assessment			
Methodologies	Competencies	Description	Qualification
Mixed objective/subjective test	A1 A4 A9 B1 B4 B5 B7 B10 B11 B12 C1 C3 C4	Exam or objective test	55
Guest lecture / keynote speech	A1 A9 C1	Active participation during the guest lectures.	5
Seminar	A1 A4 A9 B1 B4 B7 C3 C4	Solving the proposed problems.	30
Supervised projects	A1 A4 B4 B5 B7 B10 B11 B12 C1 C3	Resolution and / or presentation of the supervised works.	10

Assessment comments
The evaluation of the subject is by continuous assessment and a final test. Continuous assessment has a weight of 45% in the qualification. The rest will sign the result of the final test.

Sources of information	
Basic	- J. M. Ziman (). Principles of the Theory of Solids. - P. A. Cox (). The Electronic Structure and Chemistry of Solids. - S. Elliot (). The Physics and Chemistry of Solids.
Complementary	- C. F. Bohren and D. R. Huffman (). Absorption and Scattering of light by small particles. - J. B. Goodenough (). Magnetism and the Chemical Bond.

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
- It is very important to attend all classes.- Problem solving and self-assessment exercises is key in learning this subject. It may be useful to start with the problems resolved in the manuals of support and referral to follow later with problems proposed at the end of each chapter in the reference manuals.- It is essential to consult the bibliography and try to complete with advanced aspects most fundamental concepts that are explained in class.