GUÍA DOCENTE ABREVIADA DE LA ASIGNATURA

G1779 - Physics of Materials

Doble Grado en Física y Matemáticas
Grado en Física
Grado en Física

Curso Académico 2023-2024

1. DATOS IDENTIFICATIVOS				
Título/s	Doble Grado en Física y Matemáticas Grado en Física Grado en Física		Tipología y Curso	Optativa. Curso 5 Optativa. Curso 4
Centro	Facultad de Ciencias			
Módulo / materia	MATERIA FÍSICA DE MATERIALES MENCIÓN EN FÍSICA FUNDAMENTAL			
Código y denominación	G1779 - Physics of Materials			
Créditos ECTS	6	Cuatrimestre	Cuatrimestral (2)	
Web	https://aulavirtual.unican.es			
Idioma de impartición	Inglés		Forma de impartición	Presencial

Departamento	DPTO. CIENCIAS DE LA TIERRA Y FISICA DE LA MATERIA CONDENSADA
Profesor responsable	FERNANDO RODRIGUEZ GONZALEZ
E-mail	fernando.rodriguez@unican.es
Número despacho	Facultad de Ciencias. Planta: + 2. DESPACHO PROFESORES (2008)
Otros profesores	FERNANDO AGUADO MENENDEZ JAVIER RUIZ FUERTES

3.1 RESULTADOS DE APRENDIZAJE
- Knowledge and use of basic models and theories for describing the physical properties of materials.
- Skill development to setup experiments for measuring physical properties of materials.
- Employ of basic instrumental devices of interest in materials science.
- To be able of classifying and characterizing materials according to their structure.

4. OBJETIVOS
Classification and characterization of materials according to their structure and physical properties.
Knowledge of physical models enabling students to understand a wide variety of materials properties.
Measuring physical properties in different types of materials.
Acquire an ample background of knowledge and skillness in different experimental techniques and apparatuses of common use in research laboratory and industry.
The study of technical reports about a complex instrument to apply to new physical measurements.

6. ORGANIZACIÓN DOCENTE	
CONTENIDOS	
1	Topic 1 Introduction. Types and classification of materials. Relationship between structure and physical properties.
2	Topic 2 Dielectric and Optical Properties of materials. Insulators and Semiconductors. Complex refractive index. Absorption and Reflection of light by Materials. Absorption and luminescence processes in solids. Configurational coordinate energy diagrams. Relevant Optical and Diectectric phenomena.
3	Topic 3 Laboratory works Microscopic techniques for materials characterization. Optical absorption spectroscopy: electronic structure of insulators and semiconductors. Emission/excitation spectroscopy and photoluminescence (PL) lifetime measurements: PL materials.
4	Topic 4 Electrical properties of materials. Insulators, Metals and Semiconductors. Band structure and conductivity. Applications: 2D and nanostructure materials.
5	Topic 5 Magnetic properties of materials. Magnetic phenomena: microscopic description. Diamagnetism, Paramagnetism and Ferromagnetism. Other magnetic structures: structural characterization. Applications: 2D and nanostructure materials.
6	Topic 6 Functional and nanostructured materials. Structure and physical properties. Applications. Multifunctional materials. Interplay between properties and types of materials. Nanometric sized materials. Size effects and quantum confinement. Influence on physical properties.
7	Topic 7 Laboratory works: Macroscopic techniques for analysis and characterization of materials Electric resistivity in metals. Thermal effects. Characterization of Ferromagnetic or ferroelectric materials.
8	Topic 8 Superconductivity. Experimental phenomena and characterization of superconductors –types. BCS theory. Predictions and new superconductor materials. Laboratory work: magnetic levitation

7. MÉTODOS DE LA EVALUACIÓN

Descripción	Tipología	Eval. Final	Recuper.	%
Practical work reports	Trabajo	No	No	50,00
Final exam	Examen escrito	Sí	Sí	50,00
Control exams	Examen escrito	Sí	Sí	0,00
TOTAL				100,00

Observaciones

The student must do four experiments along the course in one 4-5 hour laboratory sessions in six different weeks. The experiments will be done by the students in the Solid State (S131), Diffractometry (1019), and Labo2 (1062) laboratories. The student must write three laboratory reports and one result sheet (Topic 5). The evaluation of each laboratory work will consist of 1) the experimental report and/or result sheet (80%) and 2) laboratory work (20%). The latter evaluation is based on a personal and continuous tracking about queries and attitude of the student in the laboratory (1,25 hr/report).
There will be three controls through test exams (45 min. each) and the final exam will last two hours.
The final grade of the course will be the average of grades obtained from laboratory works and exams.

In the event of an online teaching imposed by COVID19 or other causes, the laboratory work will be explained online and the corresponding experimental data will be transferred to each student for study and analysis following indications in the practical work guide. The evaluation will be done in the same way as in the lab, although the analysis work will be increased to compensate the lack of experimental work in the laboratory.

Criterios de evaluación para estudiantes a tiempo parcial

The Professor will pay attention to provide additional teaching support to partial-time students.

8. BIBLIOGRAFÍA Y MATERIALES DIDÁCTICOS

BÁSICA

Topics 1-8
R. J. Naumann, Introduction to the Physics and Chemistry of Materials, CRC Press, Boca raton (2009).

Topics 1,2,6,7
M. Fox, Optical Properties of Solids, Oxford University Press, Oxford (2001).

Topics 1,3-6,8
K. H. J. Buschow and F. R. De Boer, Physics of Magnetism and Magnetic Materials, Kluwer (2003).

Esta es la Guía Docente abreviada de la asignatura. Tienes también publicada en la Web la información más detallada de la asignatura en la Guía Docente Completa.