SUBJECT TEACHING GUIDE

M1294 - Practical Laboratory Tests on New Materials

Master's Degree in New Materials

Academic year 2022-2023

1. IDENTIFYING DATA					
Degree	Master's Degree in New Materials			Type and Year	Compulsory. Year 1
Faculty	Faculty of Sciences				
Discipline	Module of Compulsory Subjects				
Course unit title and code	M1294 - Practical Laboratory Tests on New Materials				
Number of ECTS credits allocated	5	Term		Semester based (1)	
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. CIENCIAS DE LA TIERRA Y FISICA DE LA MATERIA CONDENSADA
Name of lecturer	JOSE IGNACIO ESPESO MARTINEZ
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Other lecturers	FERNANDO GONZALEZ MARTINEZ JESUS MARIA RODRIGUEZ FERNANDEZ FERNANDO AGUADO MENENDEZ DIEGO FERREÑO BLANCO SERGIO CICERO GONZALEZ ANA CARMEN PERDIGON ALLER JAVIER RUIZ FUERTES

3.1 LEARNING OUTCOMES
- Competence in experimental design and measurement parameters optimization in order to attain the best results.
- Bibliographic research in different knowledge areas, in order to properly establish the experimental conditions and improve the results analysis.
- Proper use of different experimental techniques, applied into different fields.
- Written and oral presentation of experimental results, together with the corresponding analysis, discussion and conclusions.

4. OBJECTIVES
Knowing the bases of the most usual experimental techniques in synthesis and characterization of materials among different fields.
Carrying out simple experiments with some of these techniques in order to get used with the instrumentation, data treatment and kind of results that can be obtained.
Analyzing results from more complex experiments, in particular, those that cannot be done during a single practical session or in a small laboratory.
Apprehending the potential of each technique and its usefulness inside different research fields.

6. COURSE ORGANIZATION	
CONTENTS	
1	SYNTHESIS: Metallic materials synthesis. Nanomaterials synthesis.
2	MICROSCOPY AND DIFFRACTION: Scanning and Transmission Electronic Microscopy. EDS microanalysis. X-ray powder diffraction. Rietveld method.
3	ELECTRICAL, MAGNETIC AND OPTICAL PROPERTIES: Transport properties characterization. Magnetic analysis: susceptibility and magnetization. Optical spectroscopies.
4	MECHANICAL AND THERMAL PROPERTIES: Texture and surface properties. Tension, compression, fatigue and fracture mechanical tests. Corrosion and oxidation. Thermal analysis: Specific heat and thermal expansion.
5	FACILITIES IN TECHNOLOGICAL INSTITUTES AND COMPANIES: Visit to the experimental facilities of some institute and/or company related with materials production and/or characterization.

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
Lab work	Laboratory evaluation	No	No	10,00
Written reports on the experimental work	Work	No	Yes	70,00
Oral presentation of the experimental work	Oral Exam	No	No	20,00
TOTAL				100,00
Observations				
Observations for part-time students				
Do not concern				

8. BIBLIOGRAPHY AND TEACHING MATERIALS
BASIC
J. Bermúdez-Polonio, Métodos de difracción de rayos X: principios y aplicaciones (Pirámide, 1981)
C. Hammond, The basics of crystallography and diffraction (Oxford University Press, 2001)
Ian M. Watt, The principles and practice of electron microscopy (Cambridge University Press, 1997)
P.J. Goodhew, Electron microscopy and analysis (Springer-Verlag, 1975)
D.B. Williams y C.B. Carte, Transmission electron microscopy: a textbook for materials science (Plenum Press, 1996)
M. Fox, Optical properties of Solids (Oxford University Press, 2002)
J. García Solé, L.E. Bausá y D. Jaque, An introduction to the optical properties of inorganic solids (John Wiley & Sons, 2005)
W.D. Callister, Materials science and engineering: an introduction (John Wiley, 2003)
T.L.Anderson, Fracture Mechanics: Fundamentals and Applications, Third Edition, (CRC Press,2004)
C. Kittel, Introducción a la física del estado sólido (Reverté, 1993)
M. de Podesta, Understanding the properties of matter (Taylor &Francis, 2002)
D. Craik, Magnetism: Principles and Applications (John Wiley, 1995)
D. Jiles, Introduction to Magnetism and Magnetc Materials (Chapman &Hall, 1998)
Verified syntheses of mesoporous materials, V. Meynen, P. Cool, E.F. Vansant, Microporous and Mesoporous Materials 125 (2009) 170-223