SUBJECT TEACHING GUIDE

M1309 - High Pressure Techniques

Master's Degree in New Materials

Academic year 2021-2022

1. IDENTIFYING DATA					
Degree	Master's Degree in New Materials			Type and Year	Optional. Year 1
Faculty	Faculty of Sciences				
Discipline	General Optional Module				
Course unit title and code	M1309 - High Pressure Techniques				
Number of ECTS credits allocated	5	Term		Semester based (2)	
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	FERNANDO RODRIGUEZ GONZALEZ
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Office	Facultad de Ciencias. Planta: + 2. DESPACHO PROFESORES (2008)
Other lecturers	RAFAEL VALIENTE BARROSO IGNACIO HERNANDEZ CAMPO FERNANDO AGUADO MENENDEZ

3.1 LEARNING OUTCOMES
- To get a background of theory of materials at microscopic level aiming to explain their properties under high pressure conditions.
- To know the capacity of high-pressure techniques and their potential in Materials Science.
- To know the basis of working, setup, handling, loading of pressure cells, as well as to do basic experiments employing different experimental techniques with distintc types of cell.
- To write a report similarly to a research paper on the performed experiments.
- Micro manipulation of materials and characterization of systems in micro environments under extreme conditions.
- To know the basis, experimental techniques and instrumentation for materials characterization, as well as physical phenomena of interest in materials induced at high pressure.
- To handle materials characterization techniques adapted to high pressure cells.
- To get and interpret high pressure experimental results on the basis of microscopic models of Materials Science

4. OBJECTIVES
Study of Matter at High Pressure. Introduction, Theoretical background and experiments.
Methods for producing high pressrue (diamond anvil cells, explosions, shock waves).
Materials characterization techniques under high pressure conditions (spectroscopy, diffraction, magnetization, conductivity, etc.)
Analysis and interpretation of high pressure results (equation of state, phase transitions, volume-pressrue dependances, etc.)
To write a report similar to a scientific paper.

6. COURSE ORGANIZATION	
CONTENTS	
1	PRESSURE CELLS/BACKGROUND AND APPLICATIONS/ PREINDENTATION+HIDROSTATIC CAVITY/ PRESSURE SENSORS; EQUATION OF STATE/ LUMINESCENCE OF RUBY UNDER PRESSURE
2	CHARACTERIZATION TECHNIQUES/ ELECTRONIC PROPERTIES / OPTICAL ABSORPTION: SEMICONDUCTOR GAP UNDER PRESSURE
3	RAMAN - IR SPECTROSCOPIES/ MICROSCOPE AND IMAGING AT HIGH PRESSURE/ RAMAN OF DIAMOND AND SILICON UNDER PRESSURE
4	MAGNETIC AND TRANSPORT PROPERTIES/ MAGNETIZATION AT HIGH PRESSURE

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Continous evaluation through experimental reports and test-type exams.	Laboratory evaluation	No	No	50,00
Test-type exam	Written exam	Yes	Yes	40,00
Reading and comprehension of scientific paper.	Work	No	Yes	10,00
TOTAL				100,00

Observations

One report of all performed experiments.
Test-type final exam.
Report on a scientific paper.

Observations for part-time students

Partial-time students will be supported for doing practical works in due time with flexible deadline for presenting reports.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

An introduction to high pressure science and technology, J.M. Recio, J. M. Menéndez, A. Otero de la Roza, CRC Press, Taylor & Francis, 2015