SUBJECT TEACHING GUIDE

G33 - Basic Experimental Physics III: Matter and its Properties

Double Degree in Physics and Mathematics
Degree in Physics
Degree in Physics
Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	Double Degree in Physics and Mathematics Degree in Physics			Type and Year	Core. Year 1 Core. Year 1
Faculty	Faculty of Sciences				
Discipline	Subject Area: Basic Experimental Physics Basic Module				
Course unit title and code	G33 - Basic Experimental Physics III: Matter and its Properties				
Number of ECTS credits allocated	6	Term		Semester based (2)	
Web	https://moodle.unican.es				
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	LUIS FERNANDEZ BARQUIN
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Office	Facultad de Ciencias. Planta: + 2. DESPACHO PROFESORES (2016)
Other lecturers	JONATAN PIEDRA GOMEZ JESUS MANUEL VIZAN GARCIA JAVIER RUIZ FUERTES

3.1 LEARNING OUTCOMES
- Appreciate Physics as a way to understand nature.
- Discuss and be able to understand the interpretation of physical phenomena in the areas of mechanics, optics, waves, structure of matter, electricity and electronics by applying basic models.
- To identify the key point of a physical phenomenum and how to analyse the experimentally taking into account the proposed model and the mathematical requirements.
- The undergraduate will be able to present, analyse and interpret key experimental results in short reports. These reports will display a very clear structure following present recommendations: Abstract, Introduction, Experimental, Results, Discussion and Conclusion. Acknowledgements and References.
- - The undergraduate will solve problems and calculate magnitudes in relation to the basic concepts of the mentioned subjects. Regarding Fluids and Thermodynamics they will establish the main equations and the value of some magnitudes . For the rest, simple problems will be engaged due to the relatively low mathematics level. Simple crystallographic structures will be reviewed.
- - Relevant phenomena and properties will be known and described of Fluid & Thermodynamics, Atoms & Molecules, Solids and Nuclei & Particles. Precise knowledge of Bernouilli equation, 1st principle and Kinetic Energy.They will describe Bohr´s atom, quantum numbers and electronic configurations. Moreover, they will get input of bonding types, crystalline structures and some macroscopic properties. Finally they will study Nuclear and Particle Physics.

4. OBJECTIVES
- Undergraduates will be able to present, analyse and interpret experimental results in short scientific-technological reports. These reports have a clear structure following present tendency with an Abstract , Introduction, Experimental, Results, Discussion and conclusion + References.
- Undergraduates will be able to solve problems and calculate magnitudes in relation to fundamental concepts of the subject blocks. In the case of Fluids and Thermodynamics they will be able to establish the ruling equations and the value of certain magnitudes. In the rest of the course, the maths at this level can help to solve only simple problems. IN crystallography simple structures will be analysed and plotted out.
- Undergraduates will be able to know and describe phenomena and properties associated to subject blocks: Fluids and Thermodynamics, Atoms and Molecules, Solids and and Nucleii and Particles. It is especially relevant the knowledge of Bernouilli's law, 1st thermodynamics principle and Kinetic theory. They will be able to describe Bohr's atom, quantum numbers and electronic configurations. Moreover they will learn on types of binding, simple crystalline structures and some macroscopic properties of solids. Finally Nuclear physics and Particle physics will be reviewed.
- To understand the interpretation of relevant physical phenomena . To obtain experimental result and calculate magnitudes related to the following Sections: Fluids & Thermodynamics, Atoms & Molecules, Solids & Crystalline Structure, Nuclei and Particles.

6. COURSE ORGANIZATION	
CONTENTS	
1	Fluids & Thermodynamics. Boyle-Mariotte and Descartes diver experiences. Lab: Determination of the density of a liquid by the Archimedes and Oscillation methods . Lab: Latent heat of vaporisation of liquid nitrogen.
2	Quantum Physics and Atomic and Molecular Physics . Demonstrations of LED and Planck constant and X-ray spectroscopy.
3	Structure and bonding of Solids. Electronic structure and properties of solids. Lab: X- ray diffraction. Lab: Photoelectric effect.
4	Nuclear Physics and Radioactivity. Fundamental interactions and particles. Lab: Gamma rays decay. Lab: Simulations of CERN experiments.

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
Short evaluations of Subject blocks. 4 evaluations.	Written exam	No	Yes	20,00
Final examination.	Written exam	Yes	Yes	40,00
Description Lab (experimental) work. 6 memos to be evaluated.	Laboratory evaluation	Yes	No	30,00
Experimental demonstrations evaluation (short).	Written exam	No	Yes	10,00
TOTAL				100,00

Observations
Experimental lab work: Delay penalty (2 points: 7 days. 4 points > 7 days. 3 weeks the mark will be 0. Controls, experiences and final exam can be re-evaluated in extraordinary exam. Undergraduates without Lab logbook will not be evaluated (Experimental reports). Plagiarism in memos will be checked out. The existing cases will be forwarded to University authorities, to be punish severily. This will apply for exams as well.
Observations for part-time students
Part-time undergraduate will attend the Experimental Labs and present the Experimental Reports.

8. BIBLIOGRAPHY AND TEACHING MATERIALS
BASIC
1.- R. A. Serway. "Física". Ed. Interamericana, 1985 (y otros posteriores). 9ª Edición Serway, Jewett. "Física para ciencias e ingeniería". Ed. Mexico (2015). Todos los bloques. Los libros básicos propuestos 1 y 2 son equivalentes y puede seguirse cualquiera de los dos, indistintamente.
2.- P. A. Tipler. "Física". Ed Reverté, 1992. Todos los bloques. Los libros básicos propuestos 1 y 2 son equivalentes y puede seguirse cualquiera de los dos, indistintamente.
3.- R. Chang, “Química”. Ed. Mc Graw Hill. 2010 (10ª Ed.). Específico Tema 5. No está suficientemente cubierto en los dos libros anteriores. Esta materia es mucho más variada que otras de primer curso y por tanto es necesario incluir este libro en la bibliografía básica. El profesorado así lo indica durante el curso y facilita la comprensión.
4.- William D. Callister, "Introducción a la Ciencia e Ingeniería de los Materiales". Ed. Limusa-Wiley, 2009. Específico Temas 6 y 7. No está suficientemente cubierto en los libros anteriores. Esta materia es mucho más variada que otras de primer curso y por tanto es necesario incluir este libro en la bibliografía básica.El profesorado así lo indica durante el curso y facilita la comprensión.