SUBJECT TEACHING GUIDE

G32 - Basic Experimental Physics II: Waves: Light and Sound

Double Degree in Physics and Mathematics
Degree in Physics

Academic year 2021-2022

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	G32 - Basic Experimental Physics II: Waves: Light and Sound				
Number of ECTS credits allocated	6	Term		Semester based (1)	
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. FISICA APLICADA
Name of lecturer	JOSE MARIA SAIZ VEGA
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Other lecturers	PEDRO JOSE VALLE HERRERO FRANCISCO MATORRAS WEINIG

3.1 LEARNING OUTCOMES
- To understand the basic magnitudes associated to a wave.
- To apply the propagation concept to experiments with mechanic waves. Understand the longitudinal and transverse nature of waves.
- To apply the superposition principle to interferences and standing waves.
- To understand the origin of Doppler effect, applying it to different situations.
- To apply geometrical optics laws to mirrors and prisms. Understand the TIR and confinement concepts.
- To be able to measure the refractive index of a prism experimentally.
- To explain optical phenomena from a geometrical optics point of view. To calculate paraxial images through simple systems.
- To understand the limitation of optical systems, both in the sense of finite aperture and field of view and as performance limitation connectted with optical aberrations.
- To understand how the eye works and the main refractive ametropies, both directly and on a scale-model in the laboratory.
- To understand how the most important optical instruments work, getting familiar with their main components. Camera, telescope, microscope, ...)
- To understand the meaning of the wave equation. Understand the concepts like polarization (including dichroism and Malus Law).
- To obtain the refraction and reflection laws from the Huygens Principle.
- To learn and understand the conditions under which light interference may be produced, focussing on the Young and Michelson schemes and solving problems on both geometries.
- To recognize the situations in which optical diffraction plays a role and identify some diffraction patterns, like those associated to circular apertures or slits.
- To get some laboratory skills in optics.

4. OBJECTIVES
In summary: to reach the above described results.
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6. COURSE ORGANIZATION

	CONTENTS
1	1.- Waves. General concepts. 2.- Wave superposition. 3.- Standing waves. [Demo session on Lessons 1-3] 4.- Wave propagation [Experiment #1: Doppler effect] 5.- Sound [Demo session on Lessons 4-5] [Experiment #2: Properties of sound]
2	6.- Fundamentals of geometrical optics. 7.- Optical systems. [Experiment #3: Focal length of a lens] 8.- Light limitation and image quality. [Demo session on Lessons 6-8] 9.- The eye and other imaging systems. 10.- Microscopes and telescopes. [Demo session on Lessons 9-10]
3	11.- Wave nature of light. Propagation and polarization. [Experiment #4: Interferometry] 12.- Light interferometry. 13.- Difraction: Basic phenomena and gratings. [Demo session on Lessons 11-13]

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
After a demo sessions in the lab, carried out by the teacher, students are asked to fill in a short true/false test.	Laboratory evaluation	No	No	10,00
After finishing a lesson, or every two if they are short, students are asked to fill in a short true/false test on questions related to matters discussed in the class.	Written exam	No	Yes	15,00
During lab experiments student's work is assessed in several ways: By questions at the beginning of the session, by observing how the experiment is performed and by revising the results they present inmediately after the session.	Laboratory evaluation	No	No	25,00
Students are given exercises to do on their own and give back to the teacher.	Others	No	Yes	15,00
The final exam is divided in two parts: First (about 1h) is composed of questions and second (about 2h) is composed of exercises.	Written exam	Yes	Yes	35,00
TOTAL				100,00

Observations
The part of the assessment that is based on the laboratory work is approximately 40%.

Observations for part-time students
For part-time students some lab sessions could be adapted to his/her working schedule.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC
Material didáctico disponible en el Aula Virtual UC.
"FISICA para la ciencia y la tecnologia"; Paul A. Tipler; Ed. Reverte; 4ª Edicion, 2001