SUBJECT TEACHING GUIDE

G72 - Photonics

Double Degree in Physics and Mathematics
Degree in Physics
Degree in Physics

Academic year 2024-2025

1. IDENTIFYING DATA					
Degree	Double Degree in Physics and Mathematics Degree in Physics Degree in Physics			Type and Year	Optional. Year 5 Optional. Year 4
Faculty	Faculty of Sciences				
Discipline	Subject Area: Photonics Mention in Fundamental Physics				
Course unit title and code	G72 - Photonics				
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	MANUEL PEREZ CAGIGAL
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Other lecturers	FRANCISCO GONZALEZ FERNANDEZ PEDRO JOSE VALLE HERRERO ANGEL ALBERTO VALLE GUTIERREZ

3.1 LEARNING OUTCOMES

- - Understand basics of Photonics.
- - Understand the operation of photonic devices and the physical processes in which they are based.
- - Understand the quantum mechanical basics of the matter-radiation interaction.
- - Acquire skills in the design and use of simple photonic experiments.
- - To acquire knowledge of the different applications of photonics in various fields .
- - To complement theoretical knowledge acquired in other subjects such as Quantum Mechanics and Structure of Matter .
- - Know how to apply the diverse knowledge of basic physics already acquired to specific problems.
- - Know how to apply experimental techniques in fields other than physics, where photonics plays an important role.
- - Acquire skills in handling scientific instrumentation

4. OBJECTIVES

The aim of the course is to introduce the basics of Photonics. This is a multidimensional approach since topics like the basics of Fourier optics, the description of light-matter interaction or description sources and detectors are included.

6. SUBJECT PROGRAM

CONTENTS	
1	Fourier Optics: Propagation in free space, Fourier Transform optics, Imaging, Holography. Resonators: Plano, Confocal, Matrix ABCD, Stability, resonant frequencies.
2	Atoms, molecules and solids, light-matter interaction, thermal Light, Luminescence
3	Types of optical transmitters, Basic features, Emitting incoherent light emitting diodes, Lasers, Semiconductor Lasers. Types of optical detectors, Basic features, Noise, photon detection, Thermal detectors, Calibration, Circuits for optical detection. Photonic devices for detecting image: Sampling Theorem, Resolution Imaging devices, LCD panels, LED panels
4	Advanced Topics: High resolution, Nanoptica, Communications
5	Detection techniques with photodiodes. Meassurement of the resolution of a CCD. Characterization of semiconductor lasers

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Theoretical issues and problems	Written exam	Yes	Yes	30,00
Participation in the classroom and elaboration of conferences and problems	Work	No	Yes	30,00
Laboratory evaluation	Others	No	Yes	30,00
Public oral presentation	Others	No	No	10,00
TOTAL				100,00

Observations
Observations for part-time students
As far as possible, according to teachers, monitoring of the course will be provided

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

- Fundamentals of Photonics. Bahaa E. A. Saleh, Malvin Carl Teich. John Wiley & Sons, Inc. 1991
- Fundamentals of Photonics. SPIE Press Book. Editor: Chandra Roychoudhuri. 2008. http://spie.org/x17229.xml.