SUBJECT TEACHING GUIDE

G52 - Electromagnetism and Optics

Double Degree in Physics and Mathematics
Degree in Physics

Academic year 2017-2018

1. IDENTIFYING DATA					
Degree	Double Degree in Physics and Mathematics Degree in Physics			Type and Year	Compulsory. Year 3 Compulsory. Year 3
Faculty	Faculty of Sciences				
Discipline	Third Year Subjects Subject Area: Electromagnetism and Optics Central Module				
Course unit title and code	G52 - Electromagnetism and Optics				
Number of ECTS credits allocated	6	Term		Semester based (1)	
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. FISICA APLICADA
Name of lecturer	FERNANDO MORENO GRACIA
E-mail	fernando.moreno@unican.es
Office	Facultad de Ciencias. Planta: + 3. DESPACHO PROFESORES (3044)
Other lecturers	FRANCISCO GONZALEZ FERNANDEZ

3.1 LEARNING OUTCOMES

- The subject matter is eminently theoretical and upon completion, the student:
  - will understand the concept of the wave, its properties and its propagation within the Electromagnetic Theory.
  - will understand the concept of polarization and will know how to handle it within the wave propagation in isotropic media.
  - will have acquired the basics of physics of radiation-matter interaction through classical models.
  - will understand the propagation of electromagnetic waves in media whose optical properties depend on the direction of propagation.
  - will have acquired the basics on interference and diffraction of electromagnetic waves.
  - will be able to solve simple problems with mathematical tools introduced in the development of electromagnetic theory.
  - will have the basic tools to address more complex problems of Electromagnetic Radiation Theory.

4. OBJECTIVES

The subject aims to introduce students to the basics of electromagnetic theory: To understand and theoretically handle the concept of wave and its electromagnetic behavior (intensity and polarization), how it propagates across different media and how it interacts with the, and to understand basic phenomena appearing due to the wave nature of the electromagnetic radiation: interference and diffraction .
Finally, it is aimed to learn to solve simple problems of basic electromagnetic theory.

6. COURSE ORGANIZATION

	CONTENTS
1	1.-WAVES. ELECTROMAGNETIC THEORY 1.1.-FUNDAMENTALS OF WAVES 1.2.-ELECTROMAGNETIC THEORY 1.3.-FOURIER THEORY
2	2.-POLARIZATION OF ELECTROMAGNETIC WAVES (EWs). PROPAGATION IN ISOTROPIC MEDIA 2.1.-FUNDAMENTALS OF POLARIZATION OF EWs 2.2.-PROPAGATION IN ISOTROPIC MEDIA. FRESNEL LAWS 2.3.-CONFINED WAVES. GUIDING OF EWs. OPTICAL FIBERS
3	3.-DISPERSION AND ABSORPTION IN DIELECTRIC, ISOTROPIC AND LINEAR MEDIA 3.1.-DIPOLE RADIATION EMISSION. ANTENNAS. 3.2.-MODELS OF RADIATION-MATTER INTERACTION. RESONANCES 3.3.-DIELECTRIC AND METALLIC MEDIA. 3.4.-ENGINEERIZED MATERIALS: METAMATERIALS.
4	4.-PROPAGATION IN ANISOTROPIC MEDIA 4.1.-PROPAGATION OF EWs 4.2.-REFRACTION AND REFLECTION OF EWs 4.3.-NATURAL AND ARTIFICIAL ANISOTROPIES 4.4.-PRODUCTION AND ANALYSIS OF POLARIZED EWs. APPLICATIONS IN THE VISIBLE RANGE
5	5.-INTERFERENCES 5.1.-FUNDAMENTALS 5.2.-INTERFERENCES WITH TWO BEAMS. APPLICATIONS 5.3.-INTERFERENCES WITH MULTIPLE WAVES. APPLICATIONS 5.4.-COHERENCE
6	6. DIFFRACTION. SCALAR THEORY 6.1.-DIFFRACTION SCALAR THEORY 6.2.-FRAUNHOFER AND FRESNEL DIFFRACTION 6.3.-EXAMPLES: SQUARE AND CIRCULAR APERTURES 6.4.-DIFFRACTION GRATINGS

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Practical exercises and their subsequent presentation	Work	No	Yes	10,00
Preparation and presentation of a topic related to the subject matter	Work	No	No	10,00
Theoretical (40%) and practical (60%) written exercises	Written exam	No	Yes	60,00
3 Test examinations distributed along the semester acccording to the subject contents	Written exam	No	Yes	20,00
TOTAL				100,00

Observations

In September an examination will be performed that will be worth 90% of the qualification. The remaining 10 % corresponds to the performance of a work.

Observations for part-time students

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

- J. Casas, “Óptica”, Librería Pons. Zaragoza (1994).
- E. Hecht “Óptica”, 3ª Edición. Adison-Wesley Iberoamericana. Madrid (2000).
- B.E.A. Saleh y M.C. Teich “Fundamentals of Photonics”, John Wiley & sons. New York (1991).