

## SUBJECT TEACHING GUIDE

### 1020 - Medical Imaging and Physiological Optics

#### University Master's Degree in the Science and Engineering of Light

Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	University Master's Degree in the Science and Engineering of Light			Type and Year	Optional. Year 1
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	SPECIALIZING IN LIFE SCIENCES AND HEALTH Specialisation Module				
Course unit title and code	1020 - Medical Imaging and Physiological Optics				
Number of ECTS credits allocated	3	Term	Semester based (2)		
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. FISICA APLICADA				
Name of lecturer	MARIA DOLORES ORTIZ MARQUEZ				
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Office	Facultad de Ciencias. Planta: + 2. DESPACHO (PTU) (2039)				
Other lecturers	OLGA MARIA CONDE PORTILLA				

### 3.1 LEARNING OUTCOMES

- The student, after taking the subject "Medical imaging and physiological optics":
  - Will value the role of photonics as a technology for clinical and pre-clinical medical imaging and will identify the advantages and disadvantages of optical imaging techniques in the context of conventional medical imaging techniques.
  - Will identify clinical areas for the application of optical imaging techniques.
  - Will describe and design spectral imaging techniques (multi-hyperspectral, reflectance, diffusion, fluorescence, Raman, FTIR) applied to the analysis of biological systems identifying the relationship between them and the chemical and molecular composition of the tissue.
  - Will describe photo-acoustic imaging techniques applied to the analysis of biological systems.
  - Will describe and configure measurement setups using the technique of optical coherence tomography for the analysis of biological systems relating the image of retro-spreading with the morphological and structural composition of the tissue.
  - Will know the basic models that allow to characterize the operation of the ocular optical system.
  - Will understand the accommodation mechanism that allows focusing at different distances .
  - Will know the different ocular optical aberrations and their effect on the quality of the retinal image .
  - Will handle technical information in English with ease related to the clinical application of optical imaging techniques.
  - Will know clinical instrumentation.

### 4. OBJECTIVES

- To evaluate the role of photonics as a technology for clinical and pre-clinical medical imaging and to identify the advantages and drawbacks of optical imaging techniques with respect to conventional medical imaging techniques.
- To identify clinical areas for the application of optical imaging techniques .
- To know different imaging techniques applied to the analysis of biological systems identifying the relationship between them and the structural and molecular composition of biological tissue: OCT, photo-acoustic, hyperspectral, etc.
- To know the basic models that allow to characterize the operation of the ocular optical system .
- To understand the accommodation mechanism that allows focusing at different distances .
- To know the different ocular optical aberrations and their effect on the quality of the retinal image .
- To know the clinical instrumentation used for the characterization of the eye as an optical system .

### 6. COURSE ORGANIZATION

#### CONTENTS

1	<p><b>BLOCK 1. MEDICAL IMAGING</b></p> <ul style="list-style-type: none"> <li>- - Optical imaging techniques in the context of biomedical imaging techniques (X-ray, CT, PET, SPECT, MRI).</li> <li>- - Spectroscopic imaging: multi / hyperspectral, DOI, DOT, fluorescence, Raman, FTIR.</li> <li>- - Photoacoustic imaging.</li> <li>- - Optical coherence tomography (OCT): principles, temporal / spectral types, functional OCT (Doppler, PS-OCT sensitive to polarization).</li> </ul>
2	<p><b>BLOCK 2. PHYSIOLOGICAL OPTICS</b></p> <ul style="list-style-type: none"> <li>- The ocular optical system: anatomy, structures and image formation.</li> <li>- Schematic eye models.</li> <li>- Optical quality of the retinal image: aberrations and ametropies.</li> <li>- Accommodation.</li> <li>- Clinical instrumentation of an ophthalmological clinic.</li> </ul>

### 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Written exam	Written exam	Yes	Yes	30,00
Reports of practices and visits	Work	No	Yes	30,00
Continuous assessment activities	Work	No	Yes	40,00
<b>TOTAL</b>				<b>100,00</b>
<b>Observations</b>				
The remote evaluation of the works, practical laboratory exercises and written tests is foreseen, in the case of a new health alert for COVID-19 make it impossible to carry out the evaluation in person				
<b>Observations for part-time students</b>				
Part-time students will be provided with information so that they can perform computer practices in a non-presential way and to deliver the different reports also on line . The part of continuous assessment activities and visits will be evaluated through a more complete final exam.				

### 8. BIBLIOGRAPHY AND TEACHING MATERIALS

#### BASIC

- Óptica Fisiológica. Psicofísica de la visión. JM Artigas, P Capilla, A Felipe, J Pujol. Iberoamericana McGraw-Hill 1995.  
 Adler's Physiology of the eye : clinical application. W. Hart. Mosby/Doyma libros 9 Ed. 1994  
 Biomedical optical imaging. J.G. Fujimoto, D.L. Farkas. Oxford University Press 2009.  
 Optical coherence tomography: technology and applications. W.D.Drexler, J.G. Fujimoto. Springer 2015.