SUBJECT TEACHING GUIDE

M2024 - Medical Imaging and Physiological Optics

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

Academic year 2022-2023

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	M2024 - 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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Other lecturers	OLGA MARIA CONDE PORTILLA VERONICA MIEITES ALONSO

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	BLOCK 1. MEDICAL IMAGING - - Optical imaging techniques in the context of biomedical imaging techniques (X-ray, CT, PET, SPECT, MRI). - - Spectroscopic imaging: multi / hyperspectral, DOI, DOT, fluorescence, Raman, FTIR. - - Photoacoustic imaging. - - Optical coherence tomography (OCT): principles, temporal / spectral types, functional OCT (Doppler, PS-OCT sensitive to polarization).
2	BLOCK 2. PHYSIOLOGICAL OPTICS - The ocular optical system: anatomy, structures and image formation. - Schematic eye models. - Optical quality of the retinal image: aberrations and ametropies. - Accommodation. - Clinical instrumentation of an ophthalmological clinic.

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
TOTAL				100,00

Observations

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

Observations for part-time students

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.