SUBJECT TEACHING GUIDE

1011 - BIOPHOTONICS

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

Academic year 2025-2026

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	1011 - BIOPHOTONICS				
Number of ECTS credits allocated	6	Term		Semester based (2)	
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. TECNOLOGIA ELECTRONICA E INGENIERIA DE SISTEMAS Y AUTOMATICA
Name of lecturer	OLGA MARIA CONDE PORTILLA
E-mail	olga.conde@unican.es
Office	Edificio Ing. de Telecomunicación Prof. José Luis García García. Planta: - 3. DESPACHO PROFESORES (S324)
Other lecturers	JOSE ALBERTO GUTIERREZ GUTIERREZ

3.1 LEARNING OUTCOMES
- The student will be able to valorate the role of photonic techniques and methods in the field of health and life sciences.
- The student will understand the interaction mechanisms between radiation and biological tissues, being able to extract significant optical properties.
- The student will be be able to describe different photonic techniques for disease diagnosis.
- The student will know and will be able to design photonic techniques to be used in therapy.
- The student will be able describe and defend the characteristics of photonic techniques for its application in surgery.
- The student will understand the principles of endoscopy selecting the most appropriate designs according to the clinical application.
- The student will identify clinical areas for the application of optical imaging techniques.
- The student will be able to handle technical information in English linked to the clinical application of optical imaging techniques.

4. OBJECTIVES
To valorate the role of photonic techniques and methods in the field of health and life sciences.
To understand the interaction mechanisms between radiation and biological tissues , being able to extract significant optical properties.
To describe different photonic techniques for disease diagnosis.
To design photonic techniques to be used in therapy.
To describe and defend the characteristics of photonic techniques for its application in surgery.
To understand the principles of endoscopy selecting the most appropriate designs according to the clinical application.
To identify clinical areas for the application of optical imaging techniques.
To handle technical information in English linked to the clinical application of optical imaging techniques.

6. SUBJECT PROGRAM	
CONTENTS	
1	Introduction.
2	Interaction of radiation with biological tissues.
3	Optical properties of biological tissues.
4	Photonics in medical diagnosis: diffusion spectroscopy, linear and non-linear scattering, absorption, etc.
5	Photonics in clinical therapy: photodynamic therapy, intense pulsed light, low energy phototherapy, etc.
6	Photonics in surgery: ablation, resection, etc.
7	Endoscopy: principles, design and applications.
8	Applications: dermatology, cardiovascular, oncology, neurosurgery, cosmetics, etc.
9	Basic ethical regulations: animals and humans.

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Continuous evaluation activities	Others	No	Yes	50,00
Laboratory practices	Laboratory evaluation	No	Yes	20,00
Final work on a biophotonic system	Work	No	Yes	30,00
Written exam	Written exam	Yes	Yes	0,00
TOTAL				100,00

Observations

The remote evaluation of the works, laboratory practical exercises and written tests is foreseen in the event that a new health alert by COVID-19 makes it impossible to carry out the evaluation.

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

"Tissue optics: light scattering methods and instruments for medical diagnostics". Valery Tuchin. SPIE Press 2015.

"Handbook of biomedical optics". D.A. Boas, C. Pitris, N. Ramanujam. CRC Press 2011.

"Biomedical photonics handbook". Tuan Vo-Dinh. CRC Press 2015.