

SUBJECT TEACHING GUIDE

M2025 - Optical Sources for Medical Applications

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	M2025 - Optical Sources for Medical Applications				
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. TECNOLOGIA ELECTRONICA E INGENIERIA DE SISTEMAS Y AUTOMATICA
Name of lecturer	FELIX FANJUL VELEZ
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Other lecturers	JOSE LUIS ARCE DIEGO

3.1 LEARNING OUTCOMES

- Knowledge of fundamental biological systems and tissues.
- Knowledge of the effects of light-biological tissue interaction and its characteristics.
- Knowledge of the mechanisms of optical biostimulation, opto-thermal interaction and photoablation and plasma-induced ablation.
- Ability to estimate the fundamental parameters necessary for the desired effects on biological tissues , given an optical source.
- Ability to know the optical distribution of a light source in a biological tissue .
- Knowledge of the types and characteristics of the main sources of light useful in medical applications.
- Ability to know the type of light source necessary to obtain the characteristics required by a medical application.
- Ability to know and take into account safety aspects in the management of light sources.
- Knowledge of probes and endoscopic systems for light sources
- Ability to know the probe or endoscopic systems suitable for a light source in a medical application.
- Knowledge of the optical sources used in diagnosis, treatment and surgery of pathologies by common techniques in clinical practice and in research.
- Ability to select adequate light sources in diagnosis, treatment or surgery of dermatological, ophthalmological pathologies and digestive, circulatory, nervous and urological systems.

4. OBJECTIVES

- To know the fundamental biological systems and tissues .
- To know the effects of the light-biological tissue interaction.
- To know how to estimate the fundamental parameters necessary for the desired effects , given an optical source.
- To know the optical distribution in a biological tissue of a light source .
- To know the main sources of light useful in medical applications .
- To know the security aspects in the management of light sources .
- To know the probes and endoscopic systems for light sources
- To know the optical sources used in diagnosis, treatment and surgery of pathologies.

6. COURSE ORGANIZATION

CONTENTS

1	Thematic Area 1. Introduction
2	Thematic Area 2: Foundations of optical sources in biomedical applications 2. Biological systems and tissues 3. Effects of the light-biological tissue interaction 4. Types and characteristics of light sources
3	Thematic Area 3: Safety and endoscopes 5. Security in handling of light sources 6. Endoscopes and probes for light sources
4	Thematic Area 4: Design and selection of light sources 7. Optical sources for diagnosis, treatment and surgery of pathologies 8. Light sources for medical applications: gastroenterology, dermatology, cardiology, ophthalmology, neurology, urology, etc.

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Reports and works	Work	No	Yes	30,00
Reports of laboratory works	Work	No	Yes	40,00
Written final test	Written exam	Yes	Yes	30,00
TOTAL				100,00
Observations				
Attendance to lab sessions and delivery of lab reports is mandatory. Remote evaluation is considered, including reports, exercises, laboratory work and written tests, in case a new COVID-19 emergency alert makes it impossible to be implemented in person.				
Observations for part-time students				
Part-time students will receive a mark composed of lab work and lab reports (40%), with the same conditions as full-time students and mandatory attendance, and a specific final exam (60%).				

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

- Vo-Dinh, T., [Biomedical Photonics Handbook], CRC Press, Boca Raton (2003).
 Ronald W. Waynant, Lasers in medicine, CRC Press, 2002.
 Markolf H. Niemz, Laser-tissue interactions : fundamentals and applications, Springer Verlag, 2004
 E. Hecht, A. Zajac, Óptica, Ed. Addison Wesley, 1996.
 L. C. Junqueira y J. Carneiro, Histología Básica, Ed. Masson, 2005.