VNIVERSITAT DE VALÈNCIA

Course Guide
43870 Advanced optical instrumentation

COURSE DATA

Data Subject	
Code	43870
Name	Advanced optical instrumentation
Cycle	Master's degree
ECTS Credits	3.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
2175 - Master's Degree in Advanced Optometry and Vision Sciences	Faculty of Physics	1	First term

Subject-matter

Degree	Subject-matter	Character
2175 - Master's Degree in Advanced Optometry and Vision Sciences	6 - Advanced optical instrumentation	Obligatory

Coordination

Name	Department
FURLAN, WALTER DANIEL	280 - Optics and Optometry and Vision Sciences

SUMMARY

The aim of the course is to familiarize students with de physical principles and applications of last generation of instruments employed in Optometry and Ophthalmology.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

The students need to be familiar with the contents of the courses: Óptica Geométrica, Instrumentos Ópticos y Optométricos y de Métodos de Exploración Clínica.
The student should have a good command of the following concepts:
Elemental vectorial algebra. Derivatives and primitives of elementary functions. Elementary linear system theory. Electromagnetic waves. Structure and optical models of the eye.

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

2175 - Master's Degree in Advanced Optometry and Vision Sciences

- Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.
- Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.
- Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.
- Students should demonstrate self-directed learning skills for continued academic growth.
- Students should possess and understand foundational knowledge that enables original thinking and research in the field.
- Know how to work in multidisciplinary teams reproducing real contexts and contributing and coordinating their own knowledge with that of other branches and participants.
- Participate in, lead and coordinate debates and discussions, be able to summarize them and extract the most relevant conclusions accepted by the majority.
- Use different presentation formats (oral, written, slide presentations, boards, etc.) to communicate knowledge, proposals and positions.
- Proyectar sobre problemas concretos sus conocimientos y saber resumir y extractar los argumentos y las conclusiones más relevantes para su resolución.
- Conoce los parámetros estructurales que se pueden extraer para cada técnica de caracterización.
- Tener capacidad de análisis crítico de la información especializada en los ámbitos propios del máster.
- Tener un compromiso ético y responsabilidad social, tanto en lo que compete a la componente asistencial ligada a la profesión de óptico-optometrista como a lo que respecta a la investigación clínica.
- Tener capacidad de trabajo en equipos multidisciplinares en el área de las ciencias de la salud.
- Analizar y comprender los nuevos métodos de exploración visual.

- Desarrollo de habilidades de aprendizaje necesarias para emprender estudios posteriores con un elevado grado de autonomía.
- Se pretende familiarizar a los/las estudiantes con las propiedades fundamentales de la radiación láser, y de sus aplicaciones, la optoelectrónica y la optomecánica que son la base de las nuevas tecnólogias terapéuticas y de diagnóstico.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

At the end of the learning process, the student should be able to:

-Understand the most advanced instruments for the eye examination from the point of view of its working principles

-Provide information on the technical characteristics of newly emerging instrumental.

-Show the utility of different exploratory techniques used to analyze eye segments

DESCRIPTION OF CONTENTS

1. Fundamentals of Optics. Review

Review of fundamental concepts of physical optics. Wave propagation, Interference, and diffraction . 2D imagaging. PSF and OTF concepts.

2. Wavefront sensors. Applications.

Measurement of aberrations. Merit functions. Adaptive Optics Systems and their applications in Vision Sciences.

3. Instruments for evaluating the cornea and the eye anterior segment.

Physical and mathematical foundations of corneal topography. Different topographic techniques.
Main features of commercial topographers.

4. Laser eye therapies

Elementary properties of light-matter interaction.
The laser. Principle of operation.
Refractive surgery.
Risk factors and laser safety measures.
Confocal microscopy. Concept of optical sectioning. Applications.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	16,00	100
Seminars	4,00	100
Laboratory practices	4,00	100
Preparation of evaluation activities	10,00	0
Preparing lectures	28,00	0
Preparation of practical classes and problem	7,00	0
TOTAL	**69,00**	

TEACHING METHODOLOGY

Lectures: exposition of the theoretical content, either in the classroom or online. Audiovisual methods will serve to illustrate the contents the examples. Task-oriented sessions (seminars): group sessions when the students will solve, discuss and analyse real cases. Discussion among the members of the group will be encouraged, and the tasks will compute in the final evaluation. Online students will use the resources for group discussion in the “Aula Virtual”. Individual tutorials with the teacher. The “Aula Virtual” can be used for all the students. Laboratory sessions, to apply theoretical content in practice

EVALUATION

Written exam, 70% of the final marks. Resolution of different tasks proposed to the students, either individually or in group, 30% of the final marks.

REFERENCES

Basic

- J.W. Goodman, Introduction to Fourier Optics (McGraw-Hill, 1996).
- Laser-Tissue Interactions: Fundamentals and Applications. Markolf H. Niemz Springer 2004 (3º ed).
- M. Corbett, D. O'Brart, E. Rosen, R. Stevenson, Corneal Topography: Principles and Applications, (BMJ Books,1999).
- Artal, P. (Ed.). Handbook of Visual Optics, Two-Volume Set. CRC Press, (2017).

Additional

- Artículos seleccionados de distintas revistas especializadas - Articles de diverses publicacions especialitzades - Selected papers of the following journals:
  Vision Research, Opthalmic and Physiological Optics, Optometry and Vision Science, Investigative Ophthalmology and Vision Science, etc.