UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

History of Modern Physics and Optical Instrumentation

2526-3-E3002Q039

Aims

The objectives fall within the area of "Professional training" and refer to the following Dublin Descriptors:

1 – Knowledge and understanding

- Acquire knowledge of the key stages in the historical development of optics and optometry
- Acquire knowledge of the foundations of physical optics, starting from interference and diffraction introduced in the 19th century up to quantum theory in the early 20th century
- Acquire knowledge of the historical development of the instruments used in the optometric field since the 19th century

2 – Applying knowledge and understanding

- Acquire skills in the use of certain instruments commonly used in optometric practice
- Acquire basic statistical skills for processing experimental data
- Acquire skills in applying the scientific method, which is essential both for understanding the topics covered and for applying them to professional practice
- Acquire the ability to understand the principles of physical optics underlying instruments and devices used in optometric practice, as well as those underlying the visual system

3 – Making judgements

- Develop the ability to reflect independently on the course content in order to acquire autonomous judgement

4 – Communication skills

- Acquire communication skills related to the course content, both in terms of historical aspects and the historical evolution of the field, as well as the concepts of physical optics developed from the 19th century

onwards

5 – Learning skills

- Develop the ability to reflect independently on the course content in order to acquire learning skills with a view to future developments in the field

Contents

The course concerns the history of optics and the concepts of physical optics developed in the last centuries, from the first lenses to spectacles, from the optics of the Seventeenth century to quantum optics, including the evolution of the main instrumentation applied in the field of optics and optometry.

Detailed program

PART 1

Lens of Layard

History of glass

History of spectacles

History of contact lenses

Alhazen, Rucellai, Mauròlico, Della Porta

PART 2

Galileo, Keplero, and the telescope: optics of the Seventeenth century

Refraction of light: Snell, Cartesio, Fermat

Diffraction: Grimaldi

The measure of the velocity of light: Roemer

Huygens e Newton

Newton and his telescope

PART 3

The optics of the Ninenteenth and Twenteenth centuries: from interference and diffraction of quantum optics

Polarization, interference, diffraction, and scattering of light

Light sources, black body

PART 4

Devices and instrumentation for optics, optometry, and ophthalmology

LABORATORY

Laboratory activities on polarization, diffraction, UV-visible spectroscopy, instrumentation for application in optics and optometry (corneal endothelial microscopy, biometer, anterior-segment optical coherence tomography, etc.).

Prerequisites

Concepts of mathematics and physics of the first year of the Degree in Optics and optometry

Teaching form

The course of 6 credits includes 4 credits of lectures corresponding to the four topics reported in the detailed program and 2 laboratory credits. Attendance at laboratory lessons is mandatory.
The details of the activity is as follows:

- 28 hours of lessons in person;
- 4 hours of interactive activities in person;
- 8 hours of activities at distance in preparation of the laboratory activities;
- 16 hours of laboratory activities in person.

Textbook and teaching resource

- notes on the e-learning page of the University
- F.W. Sears, Ottica, CEA, chapters 7-12
- notes on the laboratory activities on the e-learning page of the University

Semester

first semester

Assessment method

The test consists of a written test and an oral test.

The purpose of the written test is the extensive verification of the preparation on the exam program.

The purpose of the oral exam is to verify the ability to autonomously thinking and discussion on the topics of the program.

During the semester, four in-itinere written tests (multiple choice questions, brief exercises, graphic constructions or similar requests) will be proposed, each one part of the program, on dates communicated by the lecturer through the e-learning platform.
Alternatively, students will be able to carry out the written exam on the day of the official exam sessions. The written part of the exam on the day of the official exam will be divided into four parts so that those who have passed only one, two, or three partial tests in itinere or in previous exams can carry out only the part(s) missing or with previous negative result.

To access the oral, students will need to:

· Be in compliance with the mandatory attendance hours of the laboratory activities (at most, four hours of absence, including late arrivals or early exits); students who do not attend the minimum of laboratory hours will not be able to take the exam, if not attending the laboratory hours in another academic year.

· Obtain the sufficiency in the written exams of all the four parts of the program (in the in-itinere exams or during the written official exams).

The oral exam will cover the program of the course.

The exam can be done in English. For the written exam, the student must expressly request it to the lecturer at least one week in advance of the exam date.

Office hours

by appointment to be agreed via email

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING