UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Laboratory II

2425-2-E3001Q087

Aims

The first objective of the course is to introduce students to the methods of experimental investigation in physics, starting from the study of fundamental phenomena of optics and electromagnetism. This involves learning the correct use of laboratory equipment, developing the ability to design and implement specific measures and finally the use of calculation tools and statistical analysis of the data learned in the course of Calculation and Statistics Laboratory for a critical analysis of the results obtained in the laboratory.
The second objective is to teach students to work in teams and to write a scientific report that meets the standards of an article in a scientific journal.

Contents

- Laboratory equipment: principles of operation and use
- Design and implementation of electromagnetism experiments aimed at measuring a physical quantity or at the construction and validation of a model.
- Data analysis and drafting of a scientific report

Detailed program

Measurements concerning electromagnetic phenomena. Use of typical laboratory instruments for optics and electrical measurements: lenses, laser sources, multimeters, oscilloscopes, function generators ....

- ** Prism and grating spectrometer ** (characterization of the two analyzer instruments using lines of known wavelength, identification of lamps containing unknown gases, comparison of the two techniques).
- ** Interferometer **: wavelength measurement by interferometry using the Michelson and Fabry-Perot

configurations.
- ** Microwave: ** study of geometric and wave optics phenomena.
- ** Measurements carried out on direct and alternating current circuits **: construction and characterization of a network of passive elements (R, L, C). Study of the response to a transient and of the transfer function of a circuit (harmonic analysis).

Prerequisites

Laboratory of Computing and Statistics

Teaching form

Introductory lessons to inclusive laboratory experiences of

- insights into the topics of electromagnetism pertinent to the laboratory
- presentation of the operating principle of the main instruments used in the laboratory
- discussion of measurement techniques and possible optimization.

  Laboratory sessions dedicated to carrying out the experiences, analyzing data and drafting the report.

Textbook and teaching resource

** All the teaching material is collected (downloadable or available) on the e-learning site **

- Slides and handouts prepared by the teacher, concerning all the topics covered in the introductory lessons
- Cards that illustrate the physical phenomena object of the experience and cards that guide the realization of the same
- Videos illustrating the operation of the instrumentation
- Manual of the instrumentation used
- Adopted and recommended textbooks
- Recording of lessons

Semester

Second semester

Assessment method

** Delivery (according to the laboratory calendar) of the reports relating to the experiences carried out. **

- the drafting of the report can take place in groups but the content of the report and its delivery is the individual responsibility of each student

** Individual oral interview at the end of the course with the request of: **

- have delivered all the reports respecting the agreed deadlines
- knowing how to discuss the development of one or more experiences (physical principles underlying the measurement made, instrumentation used, methodology) with competence and clarity
- being able to critically discuss the results of a measurement demonstrating that they have developed an adequate understanding and mastery of statistical data analysis tools

Office hours

The course teachers receive by appointment to be agreed by e-mail.

Sustainable Development Goals