UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Applied Physics

2021-2-E3201Q073

Aims

The course allows to complete general physics topics that have not been addressed in first-year physics course. In particular to learn about the world of mechanical wave physics, acoustics, optics and electromagnetism. The topics will be carried out in the light of their environmental applications. In particular with reference to noise, light and electromagnetic pollution.

Lectures will be used to provide the basis for the topics of physics. The exercises to learn more about the topics and learn about the first environmental applications. In laboratory real cases of environmental pollution from physical agents (noise, light, electromagnetic) will be addressed.

The course will allow to have a basic knowledge of the environmental problems connected with physical agents, and to give the first tools to assess the environmental situation and indicate any mitigation measures.

Contents

The course will regard a theoretical introduction to different aspects of acoustics, optics, electromagnetism and e.m. radiation, followed by laboratory and outdoor experiments.

Detailed program

The Waves

- Mechanical waves

- The place to wave theory

The Sound

- Nature of Sound

- Intensity

- Spherical waves and plane waves

- Standing waves interference and resonance

- Vibrations

- Overview of noise pollution

The Light

- Nature of Light

- Interference and Diffraction

- Reflection and refraction

- Lenses and mirrors

- Introduction to Lighting

- Light pollution

Electromagnetism

- Charge, electric forces and fields

- Electric potential

- Electrostatic Energy and capacitors

- Electric current and circuitry

- Magnetism, magnetic forces and fields

- Electromagnetic induction

- Circuitry in alternate current

- Maxwell Equations and electromagnetic waves

- Electromagnetic pollution

EXERCISES

During the exercises the information of the frontal lessons will be integrated according to the laboratory experiences. Some simple exercises will also be carried out to facilitate the understanding of the topics that will be addressed during the laboratory hours.

LABORATORY

- Overview of electromagnetic pollution

- Measurement of electromagnetic pollution

- Interior lighting measurements and dimensioning of an external lighting system

- Noise pollution measurements

Prerequisites

First year math and physics courses.

Teaching form

- Lessons: 48 hours (6 credits)

- Tutorials: 10 hours (1 credit)

- Laboratory: 10 hours (1 credit)

There are 20 hours of tutoring for the preparation of the written part of the exam.

In the Covid-19 emergency period, lessons are held remotely asynchronously with synchronous videoconferencing events.

Nel periodo di emergenza Covid-19 li laboratori si svolgeranno in modalità mista: parziale presenza e lezioni videoregistrate asincrone/sincrone.

Textbook and teaching resource

J.S. WALKER, Fondamenti di Fisica (con MasteringPhysics), Pearson Education Italia (2015)

Semester

Second semester

Assessment method

Two written tests at the end of the course (one on each of the two parts of the course) followed, if necessary or requested by the student, by an oral test. Each written test produces a maximum score of 33. The oral exam is mandatory if the average of the scores obtained in the two written tests is less than 21. If the average of the scores is less than 15, one or both of the written tests must be repeated. If the oral test is not taken, the exam grade coincides with the sum of the scores obtained in the two written tests, rounded up to the whole. One or both of the written tests can also be taken "in itinere" during the lessons of the course. Each written exam is valid for one year from the date of delivery. For each of the two write exam, for the purpose of calculating the vote, the last test delivered is valid.

Each written test consists of about 10 exercises, to be answered in 120 minutes. During the written tests the use of textbooks and a calculator is allowed. The use of personal notes or exercises is not permitted.

An oral test is scheduled for the laboratory.

The final mark of the exam will be the average between the laboratory mark and that of the written tests.

During the Covid-19 emergency period, oral exams will only be online. They will be carried out using the WebEx platform as a priority and on the e-learning page of the course there will be a public link for access to the examination of possible virtual spectators.

Office hours

Every day but during the t4eaching activities, after appointment to be taken via email: giovanni.zambon@unimib.it; capelli@mib.infn.it