UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Physics

2425-1-E0201Q072

Aims

Providing the basic knowledge in general physics. The course aims also to provide skills in the physical approach to problems that may be relevant in biotechnology.

Knowledge and understanding.

After completion of the course, students will gain knowledge of the basic concepts of physics and will be able to recognize basic physical quantities and the units associated with them.

Applying knowledge and understanding.

After completion of the course, students will be able to use the understanding of basic physical principles to solve practical problems and to recognize the basic physical principles behind biological structures, bioprocesses and analytical instruments.

Making judgements.

Students will build critical thinking skills by engaging in problem solving activities and will be able to combine the basic knowledge in general physics with the content of subsequent courses.

Communication skills.

Use of an appropriate scientific vocabulary for the field.

Learning skills.

The basic knowledge in general physics will facilitate the understanding of more advanced approaches and/or of new applications.

Contents

Contents

1. Mechanics

2. Fluidostatic and Fluidodynamics

3. Thermology and Thermodynamics

4. Electromagnetism

5. Ray and wave optics

Detailed program

Detailed program

1. Mechanics:

-Basic interactions and macroscopic forces.

-Description space-time: reference system, coordinates, translational and rotational motions, vectors.

-Introduction to motion, speed, acceleration.

-Forces, the three principles of Newton.

-Linear momentum and angular momentum.

-Preservation of linear moment and its applications.

-Uniform circular motion.

-Energy and work: conservation of energy and of quantity of motion.

-linear and rotary constrained motions and oscillating motions.

2. Fluidostatic and Fluidodynamics:

-Stevin's law and Pascal's principle.

-Archimedes' principle.

-Bernoulli's principle.

-Viscosity of fluids. Turbolence. The motion of small particles in a viscous fluid.

3. Thermology and Thermodynamics:

-Thermology, scales, thermometer and thermal expansion.

-The first law of thermodynamics, perfect gases and transformations.

-Entropy and the second principle.

4. Electrostatics and Magnetism:

-Coulomb force and electric charge

-Electric field and Gauss theorem.

-Electric currents, resistances, capacities

-Magnetic force on a moving charge.

-Field generated by a current.

-The force on a thread.

5. Ray and wave Optics:

-Ray optics, lenses and mirrors.

-Wave optics.

-introduction to optical instruments.

Prerequisites

Background: basics of mathematical analysis: study of the trend of a function, derivative and integral. Basic knowledge of analytical geometry and trigonometry.

Prerequisites: none

Teaching form

34 2-hours-lectures composed by:
• a section of delivered didactics (Didattica erogativa, DE), of 5 CFU, focused on the presentation-illustration of contents by the lecturer.
• a section of interactive teaching (Didattica Interattiva, DI) of 3 CFU, including teaching interventions supplementary to delivered didactic activities, tutorials with exercises, short interventions by trainees, demonstrations, practical applications and in itinere tests aimed at personal verification of learning.

To help students prepare for the exam 16 hours supplementary activities supervised by a tutor are offered

Didactic activities are conveyed by means of face-to-face lectures.

Teaching language: Italian.

Textbook and teaching resource

Textbook and teaching resource

Learning material (slides of the lessons and exercises) is available at the e-learning platform of the course.

The video recordings of the frontal lessons will be provided, accessible in asynchronous mode as a support for studying.

Recommended textbooks:

- Principi di Fisica. Lascialfari, Borsa, Edises.

-Fisica Generale 3/ed. Alan Giambattista, Paolo Mariani, Andrea Orecchini, Francesco Spinozzi, McGrawHill.

- Fondamenti di Fisica. Halliday, Resnick, Walker. Casa Editrice Ambrosiana.

Semester

Second semester

Assessment method

Written examination with exercises and problems chosen to verify the achievement by the student of skills sufficient to solve practical problems that involve the application of physical laws. It also includes open questions to which the student answers with a free text.
The written examination is followed by an optional short interview to verifies the acquisition of basic knowledge of the physical principles discussed during the course.

Students attending the course can replace the written examination with in itinere written exams. Students with sufficient marks in in itinere exams can directly take the optional oral examination by June of the same year. Midterm marks, along with the evaluation of the optional oral examination, concur to the final grade.

It should be noted that, as reported in the “Regolamento studenti”, the teacher or student always has the right to request an oral examination.

Office hours

Contact: on demand, upon request by mail to lecturer.

Sustainable Development Goals

QUALITY EDUCATION