UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Physics

2021-1-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.

- Linear momentum and angular momentum.

-Preservation of linear moment and its applications.

- Forces, the three principles of Newton.

- Uniform circular motion. Use of vectors.

- 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 strength 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

Classroom lectures supported by Power Point slides, exercises and problems (64 h, 8 ECTS).

Supplementary tutorials (20 h): activities supporting learning and student's preparation for the exam.

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.

Recommended textbooks:

- Principi di Fisica. Lascialfari, Borsa, Edises.

- Fisica Generale, principi e applicazioni. Giambattisa, McCarthy Richardson, Richardson, McGrawHill.

- Fondamenti di Fisica. Kesten, Tauch, Zanichelli.

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

-Principi di Fisica. Jewett, Serway, EdiSES.

Semester

Second semester

Assessment method

Written examination with exercises chosen to verify the achievement by the student of skills sufficient to solve practical problems that involve the application of physical laws.

The written examination is followed by a 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 two midterm written exams. Students with sufficient marks in both of them can directly take the oral examination by July of the same year. Midterm marks, along with the evaluation of the oral examination, concur to the final grade.

Office hours

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