UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Fisica Generale

2627-1-E3006Q005

Aims

The course provides the basic concepts of general and experimental physics. As such, they represent the common and essential foundation of all scientific disciplines. Additionally, the course trains students to apply the theoretical knowledge acquired to solve real-world problems. Specifically, it teaches the abstraction process necessary for modeling the studied system and the corresponding transition to mathematical relationships.

By the end of the course, the student knows the fundamental laws governing classical mechanics and classical electromagnetism, as well as their significance and scope of application (*Knowledge and understanding*). Furthermore, the student is able to apply the acquired knowledge in the modeling, analysis, and solution of practical problems in mechanics and classical electromagnetism (*Applied knowledge and understanding*) and is capable of identifying the most suitable method for tackling different types of problems (*Independent judgment*). During the course, the student also acquires an adequate scientific language that allows them to communicate the learned concepts rigorously and appropriately (*Communication skills*). Finally, at the end of the course, the student recognizes the importance of a quantitative and rigorous description of physical quantities and the formal description of their relationships, thus acquiring a scientific approach essential for studying all scientific disciplines (*Learning skills*).

Contents

- Translational and Rotational Kinematics and Dynamics (1-4; 8-9).
- Energy of a System (5-7)
- Universal Gravitation (10)
- Fluid Mechanics (11)
- Electric Field (12-15)
- Magnetic Field (16-17)
- Electromagnetic Induction (18)
- Maxwell's Equations (19)

Detailed program

1. Physics and Measurement. Vectors
2. Kinematics. Motion in One Dimension and Two Dimensions
3. Periodic Motion
4. Dynamics. Applications of Newton's Laws
5. Energy of a System
6. Conservation of Energy
7. Momentum and Collisions
8. Rotation of a Rigid Body Around a Fixed Axis
9. Angular Momentum
10. Universal Gravitation
11. Fluid Mechanics
12. Coulomb's Law
13. The Electric Field. Electrostatic Potential. Electric Dipole. Conductors and Insulators
14. Capacitance and Capacitors
15. Electric Current in Metallic Conductors. Ohm's Law. Joule Effect. Electric Power
16. Lorentz Force and the Definition of Magnetic Induction Field
17. Magnetic Dipoles and Introduction to the Properties of Magnetic Materials
18. The Law of Electromagnetic Induction
19. Maxwell's Equations

Prerequisites

Knowledge of algebra and trigonometry is required, as well as the concepts progressively acquired during the course of Mathematical Institutions I, held in the first semester. In particular, differential calculus (derivatives and integrals).

Teaching form

Teaching with different educational methods:

- 30 lectures of 2 hours each delivered in-person;
- 10 exercises of 2 hours each delivered in-person;

The lectures and the exerciseswill be conducted in Italian.

Textbook and teaching resource

A university textbook covering classical mechanics and electromagnetism can be suitable for preparing for the exam, but it is recommended to verify with the instructor; a textbook of an appropriate level of depth is: Halliday-Resnick "Fundamentals of Physics" CEA.

Semester

Both semesters.

Assessment method

The evaluation includes a written and an oral test. It is necessary to pass the written test to access the oral one.

Written test, lasting 2 hours, consists of a part consisting of closed-ended tests with multiple choice choices) and a part consisting of exercises in which you are asked to answer simple questions that require the application of specific principles or theorems. It is necessary to reach the threshold values for the scores of the two parts, i.e. 40/60 for the questions and 6/10 for the exercises, to have access to the oral test. Examples of questions and exercises such as those of the written test are presented and discussed during the lessons as a periodic review of the various parts of the program carried out. The objective in assessing learning is the extensive control of preparation on the program and disciplinary problem solving skills.

three ongoing written tests are planned. Passing the ongoing tests allows access to the oral test until the February exam in order to be able to face the first exam of the Waves course scheduled for the second year.

Oral test on the entire program with intensive control of the ability to independently reflect on critical points of the program.
The oral test does not necessarily have to be taken in the same session as the written test. A passed written test, in fact, is considered valid until the last exam of the current academic year (i.e. within the following months of April-May) even if an oral test has a negative outcome.

At the student's request, the exam can be taken in English.

The outcome of the written test and the calendar of the oral tests are published on the course's e-learning page.

Office hours

By appointment writing one e-mail to anna.galli@unimib.it

Sustainable Development Goals

QUALITY EDUCATION