



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## SYLLABUS DEL CORSO

### Fisica

2021-1-E1301Q007

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#### Aims

The course aims to provide the basis for the physical description of nature, introducing the basic tools to represent the state and evolution of a physical system and the interactions involved, as well as providing the basic sensitivity for the experimental aspects related to measurement and evaluation of physical quantities and the main spectroscopic techniques of biological interest.

In particular:

1. The student will have to expand the knowledge and understanding of a physical problem. At the end of the course the student must know the basics of physics useful for understanding the physical processes.
2. .. At the end of the course the student must be able to apply the acquired knowledge to the subjects he will face in the following years of study and during the thesis work.
3. The student must be able to elaborate in an autonomous way what he has learned and be able to autonomously interpret the physical problems he will have to face in his school or work career.
4. At the end of the course the student will be able to express himself appropriately in the description of physical events and with exposure certainty.

#### Contents

The course will cover topics of:

Fundamentals of mechanics, Energy, Work and Conservation, Fluid mechanics, Thermodynamics, Electromagnetism, Optics, Overview of modern physics and spectroscopy

#### Detailed program

Vector description  
Measurable, scalar and vector quantities, data analysis  
Equations of motion  
Straight, parabolic, circular, harmonious motions  
Fundamental interactions and principles of dynamics  
Forces and momentum, moments of forces and angular moments  
Work, energy  
Theorem of kinetic energy, conservative and non-conservative forces, potential energy  
Conservation principles  
Amount of motion and impacts, angular momentum and orbital motions, conservation of energy  
Principles of fluidostatics and fluid dynamics  
Laws of Pascal, Stevino, Archimede, Equation of continuity, Bernoulli's equation  
Thermal energy, heat, temperature, entropy  
Kinetic theory of perfect gas - I and II principle of thermodynamics  
Electrostatic interactions  
Electric charge, electric field - Gauss theorem - electric potential - capacity  
Charge transportation  
Laws of Ohm and Kirchhoff, Joule effect - currents as sources of magnetic fields  
Magnetic fields and electromagnetic induction  
Lorentz force, Biot-Savart law, Ampere law, Faraday law  
The maxwell equations  
Description of electromagnetic phenomena, Light, energy equation and momentum  
Optical phenomena  
Laws of reflection and refraction, interference and diffraction, microscopy  
Light-matter interaction  
Photoelectric effect, photons,  
Quantum aspects of matter  
Bohr's atom, wave function, Schrodinger's equation, spectroscopic techniques  
Physical principles underlying optical spectroscopy, magnetic resonance spectroscopy, and mass spectrometry

## **Prerequisites**

Basic knowledge of mathematical analysis is required

## **Teaching form**

During the Covid-19 emergency period, lessons will take place in a mixed mode: partial attendance and asynchronous / synchronous videotaped lessons.

Frontal lessons alternated with exercises on the subjects carried out.

## **Textbook and teaching resource**

J.W. Jewett & R.A. Serway "Principi di Fisica", EdiSES, vol.1 e 2,

## **Semester**

Second semester

## **Assessment method**

The assessment of students' knowledge will be by written and oral examination.

In the written exam the student must solve different exercises concerning the main topics of the course (Mechanics, conservation of energy and work, fluid mechanics, electromagnetism and optics).

In the oral exam the topics covered in the course are discussed from a conceptual point of view to evaluate the acquired knowledge.

During the year three partial tasks are organized. Those who ultimately obtain an average overall mark in the partials equal to or greater than 25 can choose not to take the oral exam and accept the partial mark. Those who obtain a mark between 18 and 24 must take the oral exam.

## **Office hours**

On Monday after lesson

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