



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## SYLLABUS DEL CORSO

### Esperimentazioni di Fisica Computazionale

2122-3-E3001Q066

---

#### Aims

Learning the basis of scientific calculus and how to study physical problems on the computer with MATLAB

#### Contents

##### Detailed program

**Part 1:** Basic computational methods with MATLAB:

introduction, systems of linear equations, fixed point methods, interpolation, zeros and roots, leastsquares and optimization, numerical integration, ordinary differential equations, Fast Fourier Transform, pseudorandom numbers, eigenvalues and eigenvectors, partial differential equations.

**Part 2:** in depth study with applications:

Monte Carlo methods, Markov chains, random walks on graph and on the continuum, Brownian motion, importance sampling. Operator splitting symplectic methods for classical dynamics and Liouville equation. Spectral and operator-splitting methods with FFT for the Schroedinger equation.

#### Prerequisites

Teachings of previous years and basic knowledge of Classical and Quantum Mechanics

#### Teaching form

Activity in computer lab. \_\_\_\_\_

## **Textbook and teaching resource**

[\*Numerical computing with MATLAB\*](#), Chris Moler, The Mathworks.

[Calcolo Scientifico](#), Alfio Quarteroni, Fausto Saleri e Paola Gervasio, 6<sup>a</sup> edizione, Springer.

Teacher's notes and diaries/recordings of the lab activity available on [elearning.unimib.it](http://elearning.unimib.it)

## **Semester**

First and second

## **Assessment method**

Two homeworks, one for semester; the first on textbook exercises, the second on more complex problems.

A final report on the last 5-6 lab sessions.

Oral exam with discussion on the second homework and of the final report, with overall grading of the lab activity.

## **Office hours**

Anytime, also in video conference, after e-mail appointment.

---