



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## COURSE SYLLABUS

### Calculus

2122-1-E0201Q001

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#### Aims

The course aims to provide basic mathematical tools, in order to understand quantitative descriptions of natural phenomena and analyze simple mathematical model.

- Knowledge and understanding.  
The student will gain knowledge of basic notions of calculus for single variable real functions, ordinary differential equations, and linear algebra.
- Ability to apply knowledge and understanding.  
The student will be able to employ the acquired knowledge to solve problems, including problems of applied nature.
- Autonomy of judgment.  
The student will be able to elaborate on notions that he learned and to choose the most appropriate tools toward the mathematical formalization of a problem.
- Communication skills.  
The student will expand his mathematical vocabulary and he will be able to make appropriate use of it in written and oral reports.
- Learning ability.  
The student will be able to place in an appropriate context any mathematical issue it may occur in future studies.

#### Contents

Review of set theory and functions. Limits and continuous functions. Differentiable functions and derivative. Applications to the study of a graph. Primitive functions and Riemann integral. Ordinary differential equations.

Fundamentals of linear algebra.

## **Detailed program**

Review of set theory and functions: number sets and elementary functions. Limits of single-variable functions. Continuous functions: basic properties and fundamental results. Differential calculus: derivative of a single-variable function, derivatives of elementary functions, derivative rules. Fundamental theorems of differential calculus: Rolle, Lagrange, Fermat. Derivatives and limits: De l'Hospital theorem. Drawing the graph of a function. Primitive functions and Riemann integral. The fundamental theorem of calculus. First-order ordinary differential equations: separable and linear equations. Linear algebra: linear systems and matrices. Applications to life sciences problems will be discussed.

## **Prerequisites**

Background: basic algebra of real numbers, analytic geometry, trigonometry.

Prerequisites: none.

## **Teaching form**

- Classroom lectures (48 h) supported by slides.
- Exercise sessions (16 h).
- Tutorials (20 h): supplementary activities to help students in their study.

Teaching language: Italian.

## **Textbook and teaching resource**

Slides and further material as exercises, quizzes, discussions of mathematical models in biotechnological applications (prepared jointly with teachers of other courses), etc., will be published on the e-learning page of the course.

Textbook: A. Guerraggio, Matematica per le scienze (seconda edizione), Pearson 2018.

## **Semester**

First semester

## **Assessment method**

Written examination splits into two parts, that will take place the same day.

The first part consists of a multiple-choice test. In the second part, it is required to solve some problems.

The second part will be evaluated under the condition that the score in the first part reaches a fixed threshold.

## **Office hours**

By appointment arranged via email.

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