UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Mathematics I

2627-1-ESM02Q004

Aims

The objectives of this course are:

Knowledge and understanding. The student will learn the basic concepts of Calculus.

Applying knowledge and understanding. By means of several examples and exercises, the student will develop the ability of applying theorical results to specific problems.

Making judgements. The student will be able to critically tackle the study of function of one variable and related problems.

Communication skills. The student will become familiar with the language and formalism of Calculus, which will make him/her able to communicate with precision and clarity the acquired knowledge.

Learning skills. The student will be able to apply the acquired knowledge to different contexts and to examine in depth some related topics by reading books of Calculus.

Contents

Sets and functions; limits; derivatives; integrals; sequences and series; basic differential equations.

Detailed program

- Sets and functions: real numbers; basic definitions about functions.

- Limits and continuity for functions: definition; limit from the left and the right; uniqueness; techniques for the calculus of limits.
- Numerical sequences: basic definitions, properties, and limits.
- Numerical series: basic definitions; convergence; convergence tests.* Derivatives: basic definitions and rules for their calculus; relation with the monotonicity and convexity of functions; Taylor formula.
- Integrals: techniques for finding primitives; Riemann integral; Fundamental Theorem of calculus; applications to the calculus of area and volumes.
- Complex numbers: definition and elementary properties; geometric interpretation; basic operations with complex numbers; trigonometric form; n-roots of complex numbers.

Prerequisites

Basics of algebraic calculus: basic operations with fractions, radicals, powers, properties of logarithm/exponential functions; being able to solve basic equations and inequalities (I and II degree, with absolute values, with exponential functions, logarithm, irrational, with fractions, and with trigonometric functions) and problems related to these equations/inequalities; being able to read the graph of a real function; being able to solve basic trigonometric problems/equations.

Teaching form

Language: Italian. In-person learning.

- Lessons (42 hours - 6 CFU), frontal lectures (even though obviously active participation of the students is encouraged)
- Tutorials (24 hours - 2 CFU), frontal and interactive lectures, students are encouraged to participate actively

If necessary, some lectures might be online. In case, students will be notified in advance.

Textbook and teaching resource

The textbook for the course is

- M. Conti, D.L. Ferrario, S. Terracini, G. Verzini: Analisi matematica, Vol I, dal calcolo all’analisi, Apogeo, 2006.

Slides of the lectures will be made available online, as well as text and solutions for the exercises. Some quizzes will be made available online, so that students can use them to test their comprehension of the course, and train for the final exam.

Semester

First year, first semester.

Assessment method

The final exam is written, composed by two parts:

1.**Multiple choice questions**: quiz with multiple-choice questions with the aim to check the global preparation on the topics of the course. A database with quizzes similar to the ones present in the exam will be made available online.

2.**Exercises/Problems**: exercises and problems to be solved rigorously, in order to test the *problem solving* skills specific for this course. The evaluation will take into account the correctedness of the solution, as well as the explanations given to justify the various steps.

The oral part of the exam is not mandatory (an oral exam can be asked for by the student or the teacher). In case, the oral part of the exam consists in the written resolution of exercises/problems, which may be more complicated than the ones in the written examination, followed by an oral exposition of the solution.

Additional information can be found in the dedicated page on the e-learning platform. The dates of the exams can be found on the web site of the university.

Midterm exams subject to the availability of rooms, there will be 2 midtem exams analogous to the final exam. Additional information can be found in the dedicated page on the e-learning platform.

Office hours

By appointment (to be scheduled via e-mail).

Sustainable Development Goals

QUALITY EDUCATION