UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Basic Calculus - 1

2425-1-E1803M047-T1

Learning objectives

The course aims at providing students with the mathematical knowledge of the topics useful to understand models describing economic phenomena. In particular, students will learn how to use the mathematical tools which, starting from the function analytic formulation, allow to draw a qualitative graph of the function.

Contents

Analysis of functions of one variable and introduction to the study of functions of two variables.

Detailed program

Introduction to functions.

Functions of one real variable: domain, image set, graph of a function. Elementary functions. Monotonicity, maxima and minima. Inverse function.

Limits and related theorems.

Continuous functions: Weierstrass theorem, Bolzano theorem, intermediate value theorem. Discontinuities.

Indeterminate forms in the computation of limits.

Differential calculus: definition of the derivative and geometric interpretation. Points of non-differentiability. Relationship between continuity and differentiability. Rolle, Lagrange and Fermat theorems.

L'Hopital's rule. Taylor's theorem.

Convexity and concavity of a function: definition and characterizations based on the first and the second order derivatives.

Functions of two real variables: domain, level curves, partial derivatives, critical points.

Prerequisites

Elementary tools from algebra, equations and inequalities, basic knowledge of analytic geometry.

Teaching methods

The course comprises 40 hours of lectures, 36 of which will be delivered in person and 4 online, as well as 12 hours of practical exercise sessions, that will be delivered in person.

The lectures that will take place in person will be based on a hybrid teaching approach, combining conventional and interactive methods. The conventional methods include the detailed presentation and explanation of theoretical topics, which usually cover the first part of each class. The interactive methods consist in students taking an active part during lectures, answering questions and solving problems proposed by the professor, or in the form of collective discussions. Such kind of teaching approach is usually adopted during the second half of the class. It is not possible to determine in advance the exact number of hours devoted to conventional and interactive teaching methods, since they are linked together in a dynamic manner, so as to adapt to the course needs and in view of favouring the students' learning process, by combining theoretical and practical aspects.

Online lectures will be delivered in an asynchronous manner, making available prerecorded videos.

Practical exercise sessions will be interactive in nature.

Assessment methods

Written exam, consisting of practical exercises and of open theoretical questions.

Optional oral exam, possible only if the grade of the written exam is at least 18/30.

There are no midterm tests.

The written exam consists of practical exercises and of open theoretical questions, that are meant to test the knowledge of the statements of the theorems and of the proofs discussed during the lectures.

In grading the written exam, in addition to the correctness of the results, the ability in explaining the various steps will be considered as well.

The oral exam starts with a discussion of the written exam, followed by some questions regarding the topics of the course.

Textbooks and Reading Materials

A. Guerreggio, "Matematica", second, third or fourth edition. Pearson Prentice Hall

Semester

First semester.

Teaching language

Italian.

Sustainable Development Goals