UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Basic Calculus - 2

2627-1-E1808M007-T2

Learning objectives

The course aims at providing students with a solid mathematical basis, which is a foundamental prerequisite for advanced studies in economics and finance. The theoretical explanation will be complemented by classroom exercises, with the goal of supporting the development of an independent approach to problem-solving.

Expected Learning Outcomes (Dublin Descriptors):
1. Knowledge and understanding
Students will acquire a solid understanding of the main topics covered, which are mainly related to the analysis and representation of one and two variables functions.
2. Applying knowledge and understanding
Students will be able to understand and effectively apply mathematical methods to solve practical problems. Several applications in economics and finance require a solid mathematical basis. Some examples are the option pricing models, the utility functions used to describe agents' preferences and the frims' cost and production functions.
3. Making judgements
Students will develop logical and analytical skills useful for tackling and evaluating mathematically formulated problems in economics and finance.
4. Communication skills
Students will be able to use clear and precise mathematical language, enabling them to accurately and coherently communicate the knowledge acquired.
5. Learning skills
Students will develop an independent study method, enabling them to succeed in advanced quantitative studies.

Contents

Study of real functions of one real variable. Introduction to sequences and functions of two variables.

Detailed program

Definition of function, field of existence, definition of image and image set, graphical representation. Transformations of graphs. Inverse function. Composite function. Limits: definition, solution and theorems. Continuity: definition and theorems (Weierstrass, Darboux). Discontinuity points. Infinite and infinitesimal order. Techniques for solving some indeterminate forms. Asymptotic equivalence. Negligible function (little-o). Derivatives: definition, computation and geometric interpretation. Continuity-differentiability relation. De L'Hopital's rule; Rolle's theorem; Lagrange's theorem, Fermat's theorem. Monotonicity and first derivative. Critical points and local extrema. Convexity and second derivative. Inflection points. Complete function study. Taylor formula. Introduction to numerical sequences. Two variables functions: domain, level curves, gradient and stationary points, maximum and minimum points.

Prerequisites

Sets N,Z,Q,R. Powers, logarithms, exponentials and their properties.
First and second degree inequalities, rational inequalities, logarithmic and exponential inequalities.
Cartesian coordinate system: straight line, circumference and parabola.

Teaching methods

The lessons will be held mainly in presence with traditional lectures and exercises. A small percentage (anyway, smaller than 30%) could be held remotely. Remote lessons will be communicated in advance.

The course consists of:

-40 hours of lectures;
-12 hours of exercises.

About 90% of the course will be lecture-based mode (DE), the remaining 10% in interactive teaching mode (DI).

Assessment methods

The written exam consists of open theoretical questions and exercises.
The open questions evaluate the student's ability to use correct mathematical language, understand the theorems and proofs explained in lectures, and apply the logical steps used in these proofs. The exercises assesse the student's ability to apply theorems and methodologies studied in the course.

After passing the written exam, the student can ask for an optional oral exam. In the same way, the teacher can call the student for an oral exam.

There are no intermediate tests.

Textbooks and Reading Materials

Torriero, A., Scovenna M., Scaglianti, L.: Manuale di matematica. Metodi e applicazioni. CEDAM
Scovenna, M., Grassi, R.: Matematica – Esercizi e temi d'esame. CEDAM.

Semester

First term, first year

Teaching language

Italian

Sustainable Development Goals

QUALITY EDUCATION | DECENT WORK AND ECONOMIC GROWTH