SYLLABUS DEL CORSO

Matematica Generale - 1

2526-1-E3305M003-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.

Students are expected to be able to apply the theoretical concepts seen during the course to simple problems, similar to those solved during lectures and practical exercise sessions.

Expected Learning Outcomes (Dublin Descriptors):

1. Knowledge and understanding
   Students will acquire a solid understanding of the theoretical aspects connected with the main topics covered during the course, such as limits, derivatives, numerical sequences and series, integral calculus.

2. Applying knowledge and understanding
   Students will be able to effectively apply mathematical methods to solve practical problems consistent with the course topics and to deal with real-world situations in the economic field.

3. Making judgements
   Students will develop logical and analytical skills useful for tackling and solving complex problems, including those interdisciplinary in nature, and for critically evaluating the obtained results.

4. Communication skills
   Students will learn how to correctly use the mathematical language, so as to accurately and coherently express the acquired theoretical notions, as well as to effectively communicate ideas, methods and results.

5. Learning skills
   Students will develop an independent study method, enabling them to approach subsequent, more advanced studies with awareness and success.

Contents

- Study of functions with one variable
- An introduction to functions with more than one variable.
- Series
- Integrals

Detailed program

Introduction to functions.

Definition and image set, graph of a function. Simple functions. Monotonicity, maximum and minimum. Inverse function.

Limits and theorems related to the topic.

Sequences and Series: definition (types and summation), necessary condition for convergence, geometric series, telescopic series, harmonic series, series with non negative terms (convergence criteria), alternating series (Leibniz criterion).

Continuous functions: Weierstrass theorem, Zero's theorem, theorem of Intermediate values. Discontinuities.

Indeterminate forms in the computation of the limits. Landau's symbol.

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

L'Hospital's rule. Taylor's formula.

Convexity of a function: definition and characterization based on the second order derivative.

Functions with more than one variable: definition set, level curves, partial derivatives, critical points.

Integrals: definition and main properties, teorems on integrals, primitive integral (integration by parts, by substitution, intregration of rational functions), improper integrals, convergences criteria for improper integrals

Prerequisites

Elements of algebra, equations and disequalities, basic knowledge of geometry.

Teaching methods

Theoretical lectures and practical sessions.

Some of the lectures will be provided remotely (at most 30% of the hours). The teacher will communicate in advance which lessons will be provided remotely.
Most of lectures and practical sessions consist of dispensing teaching.

Assessment methods

Final written exam and (subsequent, optional) oral exam in case the grade assigned to the written exam is at least 18/30.

There will be a midterm written exam, lasting 1.5 hours.

In the written exam covering all course topics (lasting 2 hours), students have to solve 5 practical exercises and answer 2 open theoretical questions.

For the two theoretical questions, it is required to enunciate and prove theorems (if the proof has been illustrated during the lectures), and to provide definitions presented during the course.

The structure of the exercises is as follows:
Exercise 1: Transformations of the graph of elementary functions
Exercise 2: a) Limits b) Series (with limits)
Exercise 3: a) Miscellaneous b) Function of two variables
Exercise 4: Integrals
Exercise 5: Study of a function

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 (optional) oral exam starts with a discussion of the written exam, followed by some questions regarding the topics of the course.
It can contribute either positively or negatively to the final grade.

Textbooks and Reading Materials

Slides will be uploaded in the elearning course webpage.

Suggested textbooks:

Pini. R, Monti, G. "Lezione di Matematica Generale" LED Edizioni Universitarie
Scaglianti, L., Torriero, A., Scovenna, M. "Manuale di Matematica- Metodi e applicazioni" Edizioni CEDAM
Guerraggio, A. "Matematica", seconda o terza edizione. Pearson Prentice Hall
Scovenna, M., Grassi, R.: Matematica – Esercizi e temi d'esame. CEDAM.

Semester

First term

Teaching language

Italian

Sustainable Development Goals

GENDER EQUALITY