UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Financial Mathematics - 1

2526-2-E1803M051-T1

Learning objectives

The course aims to foster a critical understanding of mathematical concepts, helping students to recognize and use formal tools in their education, particularly with a view to their application in the economic, statistical, and financial fields. The course provides the fundamental notions of linear algebra, numerical sequences and series, integral calculus, financial mathematics, and an introduction to derivative instruments, presenting them as useful tools for analyzing and interpreting phenomena related to economics and finance. The theoretical component 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, including numerical sequences and series, integral calculus, linear algebra, linear programming, traditional financial mathematics, bonds, and derivative instruments.
2. Applying knowledge and understanding
   Students will be able to effectively apply mathematical methods to solve practical problems consistent with the course syllabus and to interpret real-world situations in the economic and financial domains.
3. Making judgements
   Students will develop logical and analytical skills useful for tackling and solving complex problems, including those of an interdisciplinary nature, and for critically evaluating the results obtained.
4. Communication skills
   Students will be able to use clear and precise mathematical and financial language, enabling them to accurately and coherently express the knowledge acquired and to communicate ideas, procedures, and results effectively.
5. Learning skills
   Students will develop an independent study method, enabling them to approach subsequent, more advanced studies with greater awareness and success.

Contents

Sequences and series, integrals, linear algebra and programming, choice under uncertainty, basic notions on financial mathematics and on derivatives

Detailed program

1. Sequences and series: definitions and analysis of the character of series by means of the main criteria.
2. Integrals: definitions, main results and computation.
3. Linear algebra: matrices, vectors and linear systems.
4. Linear programming.
5. Financial mathematics.
6. Bonds and immunization.
7. Introduction to derivatives: binomial model and Black-Scholes model.

Prerequisites

Functions in one and more variables, basic notions of Probability and Statistics.

The course Matematica Generale I is a **prerequisite** for the course Matematica per la Finanza.

Teaching methods

The teaching activities are organized into lectures, exercises, and tutoring sessions in preparation for the exam.
The course will be delivered primarily in-person. A portion of the teaching (up to 30% of the hours) may be conducted remotely. Remote sessions will be communicated by the instructor with adequate advance notice and may be delivered via live streaming or asynchronously.

A hybrid teaching approach is employed, combining expository teaching (ET) and interactive teaching (IT). ET includes the presentation and detailed explanation of theoretical content, which usually takes place in the first part of the lesson. IT involves active student participation through responses to questions and problems posed by the instructor, short interventions, and group discussions, typically carried out in the second part of the lesson. It is not possible to precisely establish in advance the number of hours dedicated to ET and IT, as these methods dynamically intertwine to adapt to the course's needs and foster participatory and integrated learning, combining theory and practice.

Specifically:

-56 hours of lectures will be conducted using the hybrid approach described above.

-24 hours of exercises will be carried out in an interactive mode.

Assessment methods

A **mandatory written exam** that can be taken in two ways: either two partial tests or a single comprehensive test. Both types of written exams include theoretical open-ended questions and problems/exercises.

An **oral exam** in the following cases:

1. Student summoned by the instructor;
2. Student who requests to take the oral exam (a minimum score of 18/30 on the written exam is required);
3. Attribution of honors (cum laude) awarded in the final evaluation.

All students taking the oral exam will receive a second grade during the oral session, which will be averaged arithmetically with the written exam grade. Therefore, in the overall evaluation of written and oral exams, the written exam score may increase or decrease. If the average of the written and oral exams is below 18, the student is considered to have failed and must retake the written exam. Under no circumstances will the same written exam score be valid for more than one oral exam attempt.

In both types of exams, the formal correctness of the steps, the adequacy of the mathematical language used, and the skills and knowledge acquired during the course will be assessed.

Textbooks and Reading Materials

- Matematica 4/Ed.
  Angelo Guerraggio
  ISBN Cartaceo: 9788891931870 – ISBN Digitale: 9788891931887
  https://he.pearson.it/bundle/521?isbn=9788891931887
- “Successioni, serie e integrali”, Manuale modulare di Metodi Matematici, vol. 5, a cura di Giovanna Carcano, edizioni Giappichelli Torino
- “Algebra lineare”, Manuale modulare di Metodi Matematici, vol. 4, a cura di Maria Ida Bertocchi, edizioni Giappichelli Torino
- G. Ceccarossi, F. Tramontana – Matematica Finanziaria. Con quiz di autovalutazione ed esercizi svolti e commentati, Giappichelli, Torino, 2025;
- F. Grassetti, F. Tramontana – Esercizi svolti di matematica finanziaria, Giappichelli, Torino, 2025.
- “Matematica Finanziaria classica e moderna”, F. Cacciafesta, edizioni Giappichelli Torino
- "Opzioni e futures", J. Hull
- "Esercizi di matematica per l'economia: Serie, integrali, algebra lineare, programmazione lineare", E. Mastrogiacomo, 2018, Ledizioni

- Additional teaching materials:
  Slides and lecture notes provided by the instructors (available on the e-learning platform).

Semester

First Semester

Teaching language

Italian

Sustainable Development Goals

QUALITY EDUCATION | GENDER EQUALITY | DECENT WORK AND ECONOMIC GROWTH