UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

# COURSE SYLLABUS

# Financial Mathematics - 2

**2526-2-E1802M118-E1802M021M-T2**

## Learning objectives

The course is designed to provide students with the theoretical knowledge and basic operational tools of Financial Mathematics, which are essential for understanding and solving economic and financial problems. The main concepts covered include the time value of money, interest calculations, the analysis and valuation of annuities and amortization schedules, as well as the determination of bond values. The course combines theoretical lessons with practical exercises, offering examples and case studies related to corporate financial management and the functioning of financial markets, with the aim of developing the ability to apply quantitative methods to concrete economic and financial decisions.

Upon completion of the course, students will be able to demonstrate the following:

1. Knowledge and understanding
   They will have developed a solid understanding of the main concepts covered and will be able to correctly perform calculations related to cash flows as outlined in the syllabus, demonstrating appropriate use of fundamental financial variables.

2. Applying knowledge and understanding
   They will be able to appropriately apply the mathematical tools studied to solve practical problems related to corporate financial management and the analysis of basic financial instruments, as well as to interpret and assess real economic and financial situations.

3. Making judgements
   They will demonstrate analytical skills in evaluating financial problems, critically analysing solutions, and providing coherent and well-founded interpretations.

4. Communication skills
   They will be able to clearly and coherently express their evaluations and conclusions on topics related to financial mathematics.

5. Learning skills
   They will have developed good autonomy in studying the subject and in analysing and interpreting data, enabling them to explore more advanced topics in corporate finance and financial markets with awareness and competence.

## Contents

Financial operations; Capitalization laws; Annuities; Capital accumulation; Amortization; Decision criteria; Bond securities.

## Detailed program

1. **Capitalization laws.** Financial operations. Accumulated amount, interest, discount. Capitalization and discounting laws. Interest rates and discount rates. Equivalent rates. Force of interest. Divisibility.

2. **Annuities.** Classification of annuities. Value of an annuity at time t. Calculation of present values, accumulated amounts, and key quantities for specific types of annuities. Average maturity, arithmetic mean maturity, duration.

3. **Capital accumulation and amortization.** Capital accumulation. Loan repayment. Amortization plans.

4. **Financial operations.** Decision criteria for financial operations: Internal Rate of Return (IRR), Net Present Value (NPV), Payback Period.

5. **Bonds and their valuation.** Characteristics of a bond and profitability indicators. Term structure of interest rates, spot rates, forward rates. Duration.

## Prerequisites

**Starting from the 2024–2025 cohort**, the course Matematica Generale per la Gestione Aziendale is a prerequisite for the Metodi Matematici course and, consequently, for the Matematica Finanziaria module.

**For previous cohorts**, the course Metodi Quantitativi per l'Amministrazione delle Imprese (Matematica Generale I + Statistica I) is a prerequisite for the Metodi Matematici course and, consequently, for the Matematica Finanziaria module.

## 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:

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

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

## Assessment methods

A **mandatory written exam** that can be taken during official exam sessions and includes theoretical open-ended questions as well as 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. Confirmation of honors (cum laude) awarded in the final evaluation of the Mathematical Methods course.

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. The overall evaluation, combining written and oral grades, may result in an increase or decrease of the original written exam score. If the average of the written and oral exams is below 18, the student is considered to have failed the exam 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

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;

S. Stefani, A. Torriero, G.M. Zambruno - Elementi di Matematica finanziaria e cenni di programmazione lineare Giappichelli, Torino, 2017;

G. Bolamperti, G. Ceccarossi - Elementi di Matematica finanziaria e cenni di programmazione lineare - Esercizi

Additional teaching materials:
Slides and lecture notes from 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