UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

# COURSE SYLLABUS

## Mathematical Methods - 2

**2223-2-E3301M131-T2**

### Learning objectives

The aim of this course is to provide financial and mathematical tools useful to applications in economic field. Students should be able to use mathematical tools to solve mathematical models.

### Contents

Numeric and power series. Riemann integration theory. Linear algebra. Linear Programming. Financial Mathematics.

### Detailed program

MATHS

UNIT 1 - Series

Sequences. Numeric series: character and sum of a series; series with non-negative terms, convergence criteria; series with terms of alternating sign; absolute and simple convergence. Power series; notes on Taylor / Mac Laurin series developments.

UNIT 2 - Integration theory

Indefinite integral and integration methods. Definite integral of Riemann; generalized integrals.

UNIT 3 - Linear Algebra

Matrices and operations; decisive; inverse matrix; rank; systems of linear equations; Cramer's rule; Rouché / Capelli theorem; resolution of linear systems.

UNIT 4 - Linear programming

Linear programming problem; admissible and optimal solutions; geometric and algebraic methods for the solution of a linear programming problem; duality theory

FINANCIAL MATHEMATICS

UNIT 5 - Capitalization and discounting

Principles of financial calculation; simple / compound / commercial trade discount; current and future values.

UNIT 6 - Annuities

Classification of annuities; valuation of an annuity; time indices; incorporation of capital

UNIT 7 - Depreciation

Depreciation in an elementary and financial setting; depreciation methods;

UNIT 8 - Financial projects and bonds

Financial flows analysis; investment appraisal; bond pricing; yields; duration; term structure of interest rates; forward rates.

## Prerequisites

The prerequisites for the Matematica Generale I course also apply to the Metodi Matematici course.
Matematica Generale I course is a prerequisite for the Mathematical Methods course.

## Teaching methods

At the present state, lessons will take place in presence. Anyway, the teaching method will be modified in progress, according to the guidelines of the University, if the epidemiological conditions will require it. The teaching methods will be consistent with the University guidelines, for the lessons in the classrooms as well as the tutoring in preparation for the exam.

## Assessment methods

If the pandemic conditions allow, the final assessment will be carried out with a face-to-face exam at the university in the following way:
A written exam, divided into two parts. In each session, one or both parts of the exam can be taken. To pass the exam, both parts of the written test must be passed during the same academic year. The two parts can be passed in any order.

Part of Mathematics: exercises and theory questions, to thoroughly check the learning of all topics that are part of the examination program.
Part of Financial Mathematics: a multiple-choice test, to thoroughly check the learning of all topics that are part of the examination program.
The written test evaluates the formal correctness of the passages, the adequacy of the mathematical language adopted, the skills and knowledge acquired during the course.
Based on the guidelines provided by the University, the online exams will replace usual face-to-face exams and the assessment method will be adapted accordingly.

## Textbooks and Reading Materials

Slides and teaching material at disposal on the couse site

Textbooks

Scovenna Marina, Scaglianti Luciano, Torriero Anna, Manuale di Matematica - Metodi e applicazioni, Editore: Cedam, 2010

S. Stefani, A. Torriero, G. Zambruno, Elementi di matematica finanziaria e cenni di programmazione lineare, Giappichelli Editore, V

G. Bolamperti, G. Ceccarossi, Elementi di matematica finanziaria e cenni di programmazione lineare, Giappichelli Editore, V

## Semester

First semester, first year

## Teaching language

Italian

## Sustainable Development Goals