UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Mathematical Methods

2122-2-E1802M118

Learning area

Learning objectives

The aim of the course is to give the main tools for the basics of series, integrals and linear algebra. Furthermore, it aims to clarify and discuss the basic concepts of classical Financial Mathematics and their applications to financial calculus, as well as to problems of choice based on cash flows. Through the study of bonds and their valuation we try to deepen the fundamental issues that allow us to approach the analysis of financial markets.

Contents

Matematica Generale II: Sequences and series, integrals and linear algebra.

Matematica Finanziaria: The course presents the basic principles of traditional financial mathematics (also known as "Theory of Credit"), both from a theoretical point of view and from an applicative point of view. The topics will be proposed following a fundamentally deductive approach of the discipline, understood as a logical continuation of the application of the notions learned in the courses of General Mathematics. The following arguments will then be presented: Laws of capitalization, Annuities, Constitution of a capital, Repayment of a loan, Financial transactions, Bonds.

Detailed program

Matematica Generale II:

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.

Matematica Finanziaria:

Capitalization Laws Financial transactions. Amounts, interest, discount. Capitalization laws and discounting laws. Interest rates and discount rates. Equivalent rates. Force of interest. Decomposability.

Annuities and their classification. Value of an annuity in an instant t. Calculation of present and future values, characteristic quantities of particular types of annuities. Maturity, arithmetic average maturity, Duration.

Accrued capital. Repayment of a loan. Depreciation.

Financial operations in general: investments / financing, narrowly, side, general, pure. Selection criteria for financial operations: Internal Rate of Return, Discounted Cash Flow, pay-back period.

Bonds and their valuation: characteristics of a bond and profitability indicators. Term structure, spot rates, forward rates. Duration.

Prerequisites

Prerequisites are considered indispensable knowledge and mastery of the typical topics of the Precorsi di Matematica and the course of General Mathematics I. It is required by the study plan the preparatory exam of Metodi Quantitativi.

The attendance of the course requires also some basic computer skills, particularly in this year of health emergency: use of communication systems, scanning of documents, web browsing, downloading and uploading of documents, participation in synchronous in-depth meetings programmed through Webex, participation in online exams through the platform https://esamionline.elearning.unimib.it or through Webex (in order to proceed with the written exam remotely it is necessary to read the HONOR CODE and accept the conditions).

Student who do not intend to subscribe to the HONOR CODE can write to their teacher to agree on an alternative exam methodology.

Teaching methods

Lectures will be in presence or on line following the guidelines of the University.

Assessment methods

Matematica Generale II:

The final exam (if "physical") is composed by a written part (divided in open questions and exercises) and an oral part, both mandatory. The final mark takes into account both the valuations.

In the emergency period Covid-19 exams will be only remotely managed. They will be carried out using the available platforms and on the e-learning page of the course there will be a public link for access to the exam itself.

Matematica Finanziaria:

In the emergency period Covid-19 exams will be only remotely managed. They will be carried out using the available platforms and on the e-learning page of the course there will be a public link for access to the exam itself.

The exams, after the health emergency, will be delivered in ways that will be, subsequently, advertised on the e-learning website dedicated to teaching.

Textbooks and Reading Materials

- “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

- S. Stefani, A. Torriero, G.M. Zambruno: ”Elementi di Matematica finanziaria e cenni di programmazione lineare” Giappichelli, 5 a ed., 2017