UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Mathematics for Marketing - 2

2223-2-E1801M048-T2

Learning objectives

To explain the following mathematical tools and teach how to use them: sequences, explicitly or implicitly defined, series (numeric and power series), integrals (ordinary and generalized Riemann integrals); vector spaces (in particular, Euclidean vector spaces), matrices and simultaneous linear equations; economic applications.

Moreover, the scope of the course is to supply the theoretical elements needed for formalising and solving financial problems. The main mathematical instruments having significant application in financial theory and business practice will thus be presented and discussed.

Contents

Sequences, Series, Integration theory, Linear algebra.

Principles of financial calculus. Annuities. Amortization plans. Financial flows analysis. Investment appraisal. Bond pricing.

Detailed program

Sequences. Series: character and sum of a series; series with nonnegative terms; series with alternating signs; convergence tests; absolute and non-absolute convergence. Power series: Taylor/Mac Laurin power series expansions.

Integration theory: Riemann integral; indefinite integral, primitives; fundamental theorem of calculus; integration methods; generalized integral.

Linear algebra: Euclidean vector spaces; matrices and operations; determinant; inverse matrix; rank; simultaneous linear equations; Cramer rule; Rouché-Capelli theorem; solution procedure for simultaneous linear equations systems; applications to economics.

Principles of financial calculus.

Present and future value. Simple interest, discount and compound interest, trade discount. Equivalent and convertible rates. Force of interest. Separability condition.

Annuities and perpetuities. Annuities: definition, classification and evaluation. Amortization plans.

Financial flows analysis: Pay-back, N.P.V. and I.R.R. Investment appraisal. Bond pricing. Yields.

Spot rates. Forward rates. The term structure of interest rates.

Prerequisites

Calculus I

Teaching methods

Frontal lessons and exercises.

During the Covid-19 period of emergency lectures will be given in synchronous remote mode. The corresponding video recordings will subsequently remain available in the course's website page for at least three exam dates.

Assessment methods

The exam consists of **a** written and **an oral exam** which are evaluated as follows:

- If the mark of the written test is less than 18, the exam has been failed and must be retaken;

- if the mark of the written test is greater than or equal to 18, it is possible to sustain the oral exam at the same exam event.

During the Covid-19 period of emergency exams will be given telematically. They will be performed using the WebEx platform, and in the course's e-learning page will be given a public link for access to the exam by outside virtual visitors.

Textbooks and Reading Materials

Calculus

- Allevi-Bertocchi-Birolini-Carcano-Moreni, *Manuale modulare di Metodi Matematici,* Giappichelli. Editore, seconda edizione, 2003-2004. Modulo 5: Successioni, serie, integrali.

For Linear Algebra:

- Marco Vignati, Annamaria Squillati. Appunti di Algebra Lineare con esercizi svolti, Datanova 1995.
- Allevi-Bertocchi-Birolini-Carcano-Moreni, *Manuale modulare di Metodi Matematici,* Giappichelli. Editore, seconda edizione, 2003-2004. Modulo 4: Algebra lineare.

For exercises:

- G. Carcano, *Matematica Generale. Successioni, serie, integrali. Test ed esercizi, con richiami teorici,* Datanova, Milano 2000.
- G. Carcano, *Algebra lineare. Test, esercizi e temi d'esame, svolgimenti e richiami teorici,* Datanova, Milano (2002).
- F. Brega, G.Messineo, *Esercizi di Matematica Generale. Successioni e serie –Integrali – Algebra Lineare. Giappichelli, 2006.*

For the arguments of the pre-session course:

- R. D'Ercole, *Matematica per i precorsi*, Pearson Education, 2007.

Financial calculus

- S. Stefani -A. Torriero-G.M. Zambruno, "E*lementi di matematica finanziaria e cenni di programmazione lineare",* Giappichelli, Torino, 2011 IV edizione

- G. Bolamperti, G. Ceccarossi, *Elementi di Matematica Finanziaria e cenni di Programmazione Lineare*, Esercizi, Giappichelli , Torino.

- G.Carcano, *Matematica finanziaria. Test, esercizi e temi d'esame, con svolgimenti e richiami teorici*. Datanova, Milano, 2001.

Semester

Second semester

Teaching language

Italian

Sustainable Development Goals

QUALITY EDUCATION