## **Mathematics For Economics**

## Prof. nicolo’ pecora

***COURSE AIMS AND INTENDED LEARNING OUTCOMES***

The course aims at:

* teaching students the formalism, terminology and logical tools of mathematics, which are indispensable prerequisites for correctly learning many degree programme subjects with economic, statistical and financial content;
* providing the basic elements of classical financial mathematics and the evaluation of the simplest type of bonds (these elements are of primary importance nowadays in several applied fields).

At the end of this course, the student will be able to:

* Analyse the behaviour of economic variables represented by functions both qualitatively and quantitatively.
* Discuss and solve problems of choice expressed in terms of optimisation.
* Know relevant professional topics, such as the laws of capitalization and assessment, savings plans and loan amortization.
* Know some techniques of great importance in modern finance, such as the management of a securities portfolio, and knowledge of how to use analysis tools to choose between various financial projects.

***COURSE CONTENT***

**General Mathematics**

*Preliminary topics.* Number sets. Exponentials and logarithms. Algebraic expressions. Rational, irrational, exponential and logarithmic equations and inequalities. Analytic geometry of the plane.

*Real functions of one and two variables.* Basic definitions. Global and local maxima and minima. Limits and continuous functions. Derivatives and geometric interpretation. Optimization problems.

Two variable functions: domain and level curves; gradient vector and Hessian matrix. Unconstrained optimization problems. Constrained optimisation problems. Linear programming.

**Mathematics of Finance**

Financial Laws.

*Annuities and amortization plans.*

*Financial flows and selection criteria.*

*Bonds and term structure of interest rates.*

***READING LIST***

Required:

A. Guerraggio, *Matematica,* Pearson Paravia Bruno Mondatori S.p.A., 2020.

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, Giappichelli, Torino, 2009.

Suggested:

M. Bianchi-L. Scaglianti, *Precorso di matematica,* CEDAM, Padova, 2010.

F. Brega-G. Messineo, *Esercizi di Matematica generale,* Giappichelli, Torino, 2013.

R. Cesari, *Introduzione alla Finanza Matematica*, seconda edizione, McGraw-Hill, Milano, 2012.

R.L. D’Ecclesia-L. Gardini, *Appunti di Matematica Finanziaria,* vol. I, Giappichelli, Torino, 2004.

G. Weinrich-R. Albanese, *Matematica generale I,* ISU, Milano, 2005.

***TEACHING METHOD***

Theoretical and practical lessons. Teaching also uses the Blackboard platform, where additional teaching material will be made available.

***ASSESSMENT METHOD AND CRITERIA***

The exam is designed to assess both reasoning skills and analytical rigour on the topics covered by the course. Grading will be based on a written exam. In order to pass the exam, students are required to prove their knowledge and capability to apply the notions and the theorems of the course, as well as a thorough comprehension of the mathematical reasoning.

At the end of the first module (General Mathematics), a mid-term exam will be administered, whose attendance is not mandatory. The mid-term exam, to be completed within 40 minutes, is made up by 2 exercises. The maximum score is 16 points, and it is passed if at least 9 points are obtained.

The final written exam consists of two exercises related to the contents of the second module (Mathematics of Finance). The questions bear equal weight, and they will be graded in a range from 0 (in case of no answer) to 8 (if the answer is faultless). The mid-term exam grade remains valid until the end of the winter exam session.

For those who decide not to undertake the mid-term exam, the final evaluation will be based on the final written exam, which consists in 4 exercises. The maximum grade will be 32. The exam lasts 80 minutes (40 minutes for those who took the mid-term exam).

***NOTES AND PREREQUISITES***

Attending classes is highly recommended.

Preliminary topics (General information on sets and on logic. Exponentials and logarithms. Algebraic expressions. Rational, irrational, exponential and logarithmic equations and inequalities. Analytic geometry of the plane: lines and conics. Overview of trigonometry) are fundamental requirements for a successful attendance of the course and for passing the exam. An overview will be presented during the General Mathematics Pre-Course, **the attendance of which** **is strongly recommended**. Students are required to have this preliminary knowledge before the beginning of the course.

Further details on course syllabus, textbooks to be used and additional references, if any, will be provided by the lecturer.

***OFFICE HOURS***

Information on office hours is available on the teachers’ personal page at <http://docenti.unicatt.it/>.