# Mathematics

## Prof. Fernando Bignami

**General Mathematics Module**

## Prof. Fernando Bignami

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

The course intends to provide students with the formalism, terminology and logical tools of mathematics, which are essential prerequisites for the correct assimilation of many of the economic, statistical and financial subjects of the degree course. In addition to the use of mathematical calculation, the course aims to initiate students into a rigorous approach which is logically consistent with economic-financial problems, enabling quantitative study, including through the construction and/or analysis of models.

At the end of the course students will be able to:

* Analyse, both qualitatively and quantitatively, the behaviour of economic variables represented by functions.
* Discuss and solve decision problems expressed in terms of optimisation.
* Discuss and solve simple balance problems, by means of the matrix algebra tool.

***COURSE CONTENT***

*Linear algebra: vectors, matrices and linear systems.*

*Real functions of one real variable: differential calculus and graph study.*

*Real functions of two real variables: free and constrained optimisation.*

*Elements of integral calculus: definite integral, indefinite integral and methods of integration.*

***READING LIST[[1]](#footnote-1)***

A. Torriero-M. Scovenna-L. Scaglianti , *Manuale di matematica,* CEDAM, Padua, 2009 [*Acquista da VP*](https://librerie.unicatt.it/scheda-libro/scaglianti-luciano-scovenna-marina-torriero-anna/manuale-di-matematica-9788813291891-173085.html)

M. Scovenna-R. Grassi, *Matematica. Esercizi e temi d’esame completamente risolti,* CEDAM, Padua, 2000.

Recommended reading:

A. Guerraggio, *Matematica,* Pearson Education Italia, Milan, 2014.

***TEACHING METHOD***

Mainly theoretical lectures and exercises.

The course uses the Blackboard platform, which also includes a more detailed syllabus of the course and further course material.

***ASSESSMENT METHOD AND CRITERIA***

The examination is aimed primarily at assessing reasoning skills and analytical accuracy concerning course topics. For a pass mark, students must show knowledge of concepts and theorems and the ability to apply them, as well as a certain understanding of mathematical reasoning. The written test, which lasts two hours, consists of 6 exercises and has a maximum mark of 30/30. Students must obtain at least 15/30 in order to pass.

The written test may be replaced by two mid-term tests which will take place during the course. Each test last 1 hour. Students must obtain at least 15/30 in order to pass.

If students do not take the mid-term tests, or do not pass them, there will be a written test on the official examination date.

Students can only sit the oral examination if they have passed the written test. The oral examination consists of a maximum of 3 questions, one of which is the student’s choice, of a theoretical nature relating to all the course topics. The average of the marks from the written test and the oral examination determines the final mark. The mark for this module counts for 8/13 in the final assessment of the course.

***NOTES AND PREREQUISITES***

The course is accompanied by a pre-course containing the following *Preliminary topics* which are fundamental for successfully following the course and passing the examination: an outline of set theory and logic. Number sets: from natural numbers to real numbers Exponentials and logarithms. Algebra expressions. Rational, irrational, exponential, logarithmic equations and inequalities. Analytical geometry of the plane: lines and conics. An outline of goniometry.

Further information can be found on the lecturer's webpage at http://www2.unicatt.it/unicattolica/docenti/index.html, or on the Faculty notice board.

**Financial Mathematics Module**

## Prof. Fernando Bignami

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

The module intends to provide students with theoretical notions necessary for the formalisation and solution of financial problems. The course introduces fundamental concepts of traditional Financial Mathematics for this purpose, with examples and applications commonly used in business environments and financial markets.

At the end of the course students will be able to:

* Understand professionally relevant topics, such as capitalisation and valuation laws, savings plans and amortisation of loans.
* Learn techniques of great relevance within modern finance such as managing a securities portfolio and learning analysis tools for choosing between different financial plans.

***COURSE CONTENT***

Financial laws and regimes.

Returns and depreciation.

Valuation of financial transactions.

Valuation of bonds.

Outline of immunisation.

***READING LIST***

R.L. D’Ecclesia-L. Gardini, *Appunti di Matematica Finanziaria,* vol. 1, Giappichelli, Turin, 2004.

S. Stefani-A. Torriero-G.M. Zambruno, *Elementi di Matematica Finanziaria e cenni di Programmazione Lineare,* Giappichelli, Turin, 2003.

G. Bolamperti-G. Ceccarossi, *Elementi di Matematica Finanziaria e cenni di Programmazione Lineare,* esercizi, Giappichelli, Turin, 2003.

F. Cacciafesta, *Lezioni di Matematica Finanziaria Classica e Moderna,* G. Giappichelli, Turin, 2001.

P. Bortot-U. Magnani-G. Olivieri-M. Torriggiani, *Matematica Finanziaria,* Monduzzi, Bologna, 1993.

***TEACHING METHOD***

Frontal lectures and classroom exercises. The course also uses the Blackboard platform where additional teaching material and a more detailed course syllabus will be available.

***ASSESSMENT METHOD AND CRITERIA***

The examination consists of a written and oral test and aims to assess students’ reasoning and analytical skills regarding course topics. The written test consists of three exercises and awards a maximum mark of di 30/30 It lasts 90 minutes.

Students may only sit the oral test if they have obtained at least 15/30 in the written test.

The oral test consists of a maximum of three questions, one of which the students may choose.

The mark awarded at the end of the examination will count for 5/13 in the final course mark.

***NOTES AND PREREQUISITES***

Students should have knowledge of the subjects covered in the General Mathematics Module.

Further information can be found on the lecturer's webpage at http://www2.unicatt.it/unicattolica/docenti/index.html, or on the Faculty notice board.

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

1. The books in the reading list are available at the University bookshops; they can also be purchased from other retailers. [↑](#footnote-ref-1)