# Mathematics

## Prof. Fernando Bignami

**Module of General Mathematics**

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

 The course aims to provide students with the formalism, terminology, and logical tools of mathematics, which are essential prerequisites for a correct assimilation of many of the economic, statistical, and financial disciplines of this Degree Course. In addition to the use of mathematical calculation, the course aims to initiate students to a rigorous and logically consistent approach to economic and financial problems, which enables its quantitative study, including through the construction and/or analysis of models.

***INTENDED LEARNING OUTCOMES***

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 problems of choice expressed in terms of optimisation.
* Discuss and solve simple equilibrium problems, using the tool of matrix algebra.

***COURSE CONTENT***

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

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

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

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

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

A. Torriero-M. Scovenna-L. Scaglianti , *Manuale di matematica,* CEDAM, Padua, 2009 [*Buy from 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.[*Buy from VP*](https://librerie.unicatt.it/scheda-libro/autori-vari/esercizi-di-matematica-esercitazioni-e-temi-desame-9788813343774-186249.html)

Recommended textbooks:

A. Guerraggio, *Matematica,* Pearson Education Italia, Milan, 2014.[*Buy from VP*](https://librerie.unicatt.it/scheda-libro/angelo-guerraggio/matematica-ediz-mylab-9788891904973-699166.html)

***TEACHING METHOD***

Mainly theoretical lessons and practical exercises.

The course uses the Blackboard platform to provide a more detailed syllabus of the course and additional teaching material.

***ASSESSMENT METHOD AND CRITERIA***

The exam is mostly aimed at assessing the students’ reasoning skills and analytical rigour on the topics covered by the course. To obtain a pass mark, students will have to show knowledge of concepts and theorems and be able to apply them, they will also be required to show an understanding of mathematical reasoning. The 2-hour written test consists of 6 exercises with a maximum mark of 30/30. The test is considered passed if the total score is not less than 15/30.

The written test can be replaced by two interim tests that will be held during the course. The duration of each test is 1 hour. Each test is considered passed if the mark is not less than 15/30.

If students do not take or pass the interim tests, they will have to sit a written test on official exam dates.

Students can only access the oral exam if they have passed the written test. The oral exam consists of a maximum of 3 questions, one of which is chosen by the student. The questions will be theoretical and relating to all the topics of the course. The average of the positive marks of the written test and the oral exam constitutes the final mark. The mark for this module will weigh 8/13 in the final assessment of the course.

***NOTES AND PREREQUISITES***

The course is preceded by a pre-course that will address the following *preliminary topics*, which are fundamental requirements to successfully attend the course and pass the exam: notions of set theory and logic. Numerical sets: from natural to real numbers. Exponentials and logarithms. Algebraic expressions. Rational, irrational, exponential, logarithmic equations and inequalities. Plane analytical geometry: straight lines and conic sections. Notions of goniometry. More detailed information on the course programme, on the textbooks to be used and their pre-eminent parts, as well as any other reading list material, will be provided by the teacher during lectures.

**Module of Financial Mathematics**

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

 The course aims to provide the theoretical elements necessary for the formalisation and solution of financial problems. To this end, the course will introduce fundamental concepts of traditional Financial Mathematics, with examples and applications inherent to practices commonly used in the workplace and in the financial markets.

At the end of the course, students will:

* Know professionally relevant topics, such as capitalisation and valuation laws, savings plans, loan amortisation.
* Know significantly important techniques in modern finance such as managing a securities portfolio and learning analytical tools for choosing between various financial projects.

***COURSE CONTENT***

 Laws and financial regimes.

 Annuities and depreciation.

 Evaluation of financial transactions.

 Bond valuation.

 Introduction to immunisation.

***READING LIST***

R.L. D’Ecclesia-L. Gardini, *Appunti di Matematica Finanziaria,* vol. 1, Giappichelli, Turin, 2004.[*Buy from VP*](https://librerie.unicatt.it/scheda-libro/laura-gardini-rita-laura-decclesia/appunti-di-matematica-finanziaria-9788892130746-698129.html)

S. Stefani-A. Torriero-G.M. Zambruno, *Elementi di Matematica Finanziaria e cenni di Programmazione Lineare,* Giappichelli, Turin, 2003.[*Buy from VP*](https://librerie.unicatt.it/scheda-libro/silvana-stefani-anna-torriero-giovanni-zambruno/elementi-di-matematica-finanziaria-e-cenni-di-programmazione-lineare-9788892110151-253683.html)

G. Bolamperti-G. Ceccarossi, *Elementi di Matematica Finanziaria e cenni di Programmazione Lineare,* esercizi, Giappichelli, Turin, 2003. [*Buy from VP*](https://librerie.unicatt.it/scheda-libro/bolamperti-gabriele-ceccarossi-guido/elementi-di-matematica-finanziaria-e-cenni-di-programmazione-lineare-9788834896747-173850.html)

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 practical exercises in class. The course also uses the Blackboard platform to provide additional teaching material and a more detailed syllabus of the course.

***ASSESSMENT METHOD AND CRITERIA***

The exam is aimed at assessing the students’ reasoning skills and analytical rigour on the topics covered by the course and consists of a written test and an oral exam. The written test consists of three exercises with a maximum score of 30/30. The duration is 1.5 hours.

Students could access the oral exam only if the score obtained in the written test is not less than 15/30.

The oral exam consists of a maximum of three questions, one of which is chosen by the student.

The mark obtained at the end of the exam will weigh 5/13 in the final assessment of the course.

***NOTES AND PREREQUISITES***

More detailed information on the course programme, on the textbooks used and their pre-eminent parts, as well as any other reading list material will be provided by the teacher during lectures.

Prerequisites for the students is knowledge of the General Mathematics topics.

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

1. The textbooks included in the reading list can be purchased at the University bookstores; they can also be purchased from other retailers. [↑](#footnote-ref-1)