

## Quantitative Economic Analysis (F000844)

**Course size** *(nominal values; actual values may depend on programme)*

**Credits 5.0** **Study time 150 h**

**Course offerings and teaching methods in academic year 2025-2026**

A (semester 2)      English      Gent      lecture

**Lecturers in academic year 2025-2026**

Buyse, Tim      EB21      lecturer-in-charge

**Offered in the following programmes in 2025-2026**

	crdts	offering
<a href="#">Bachelor of Science in Economics</a>	5	A
<a href="#">Bachelor of Science in Economics (Double Degree)</a>	5	A
<a href="#">Exchange programme in Economics and Business Administration</a>	5	A
<a href="#">Linking Course Master of Science in Economics</a>	5	A
<a href="#">Preparatory Course Master of Science in Economics</a>	5	A

**Teaching languages**

English

**Keywords**

Set theory, functions and mappings, matrix algebra, eigenvalues and eigenvectors, static optimization (Lagrange, Kuhn-Tucker), difference equations, differential equations, dynamic optimization, numerical methods

**Position of the course**

The objective of this course is to teach crucial mathematical economic methods and prepare students for the analysis of economic issues in graduate courses.

**Contents**

Part I. Basics

1. Fundamentals (sets, functions ...)
2. Some useful theorems (Envelope theorem, implicit function theorem, Taylor theorem ...)
3. Matrix algebra (determinants, eigenvalues and eigenvectors)

Part II. Static optimization

4. Equality-constrained optimization and Lagrange theory
5. Inequality-constrained optimization and Kuhn-Tucker theory

Part III. Dynamic analysis

6. Introduction to the dynamic system: difference and differential equations
7. Linear systems of differential equations
8. Calculus of Variation
9. Optimal control in continuous time (Hamiltonians, Pontryagin's Maximum Principle)
10. Discrete dynamic programming (Bellman's equation and value functions)
11. Stochastic dynamic optimization

Part IV

12. Numerical optimization

**Initial competences**

Mathematics I (a and b) and Mathematics II (a)  
Micro-economics

Macro-economics

### Final competences

- 1 Understand and apply quantitative economic research methods
- 2 Solve static and dynamic economic optimization problems
- 3 Acknowledge the importance of adopting a correct mathematical language and approach when solving economic problems
- 4 Formulate optimization techniques and concepts in own words and approach them critically.
- 5 Understand how mathematical solution methods for economic problems can be translated in an IT-environment

### Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

### Conditions for exam contract

Access to this course unit via an exam contract is unrestricted

### Teaching methods

Lecture

### Extra information on the teaching methods

All quantitative techniques are introduced by the lecturer (presentation of theory) and explained using economic applications. At regular time, exercises are given that can be prepared at home, and that are discussed interactively in class.

### Study material

Type: Syllabus

Name: Quantitative Economic Analysis - Lecture Notes 2024-2025

Indicative price: € 25

Optional: no

Language : English

Number of Pages : 273

Available on Ufora : No

Online Available : No

Available in the Library : No

Available through Student Association : No

### References

- Mathematics for Economists, 2nd Ed. by Michael Hoy, et. al, MIT Press, 2001 ISBN 0262089242
- Mathematical Methods for Economics, 2nd Ed. by Michael W. Klein, Addison-Wesley (2001), ISBN 0201726262.
- Fundamental Methods of Mathematical Economics, 3rd Ed. by Alpha Chiang, McGraw-Hill, 1984. ISBN 0070108137.
- A Workbook in Mathematical Methods for Economists by R. Quentin Grafton and Timothy c. Sargent, McGraw Hill, 1997 ISBN 0070071225.
- Mathematics for Economists, by Carl P. Simon and Lawrence Blume, Norton, 1994. ISBN 0393957330.
- Principles of Mathematics, by Walter Rudin, McGraw-Hill, 2nd Ed, 1965, ISBN 007054235X.
- Introduction to Mathematical Economics, by Stephen Glaister, 3rd edition, Blackwell, 1984 ISBN: 0631137122.
- Economic Dynamics, by Ronald Shone, 2nd edition, Cambridge, 2002, ISBN 0521017033.
- Numerical methods in economics, by Kenneth Judd, MIT Press, 1998, ISBN 0262100711.
- Numerical methods in Finance and Economics, by Paolo Brandimarti, 2nd edition, Wiley, 2006, ISBN 0471745030.

### Course content-related study coaching

Students can get help and explanation from the responsible professor.

### Assessment moments

end-of-term assessment

### Examination methods in case of periodic assessment during the first examination period

Written assessment

**Examination methods in case of periodic assessment during the second examination period**

Written assessment

**Examination methods in case of permanent assessment**

**Possibilities of retake in case of permanent assessment**

not applicable

**Calculation of the examination mark**