Course Specifications
Valid as from the academic year 2019-2020

Quantitative Economic Analysis (F000844)

<table>
<thead>
<tr>
<th>Course size</th>
<th>Credits</th>
<th>Study time</th>
<th>Contact hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>150 h</td>
<td>45.0 h</td>
</tr>
</tbody>
</table>

Course offerings and teaching methods in academic year 2019-2020

A (semester 2)  
English  
lecture  
30.0 h

seminar: coached exercises  
15.0 h

Lecturers in academic year 2019-2020

Buyse, Tim  
EB21  
lecturer-in-charge

Offered in the following programmes in 2019-2020

| Bachelor of Science in Economics | 5 | A |
| Exchange programme in Economics and Business Administration | 5 | A |
| Linking Course Master of Science in Economics | 5 | A |
| Preparatory Course Master of Science in Economics | 5 | A |

Teaching languages

English

Keywords

Set theory, functions and mappings, matrix algebra, eigenvalues and eigenvectors, static optimization (Lagrange, Kuhn-Tucker), 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: 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

(Approved)
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, lecture: plenary exercises

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.

Learning materials and price
Course material: Buyse, T. (2018) Quantitative Economic Analysis
Chapter from various other books will be proposed in case students need further information and background.
Estimated total cost: € 25

References

Course content-related study coaching
Students can get help and explanation from the responsible professor.

Evaluation methods
end-of-term evaluation

Examination methods in case of periodic evaluation during the first examination period
Written examination

Examination methods in case of periodic evaluation during the second examination period
Written examination

Examination methods in case of permanent evaluation
Possibilities of retake in case of permanent evaluation
not applicable

(Approved)