

COURSE SYLLABUS

Doctoral course: Mathematics for Economics, 15 credit points

Course code:
Reviewed by: RFB
Approved by: RFB
Valid as of: 2015-04-14
Version: 1
Reference number: 2016/1091-41

Education Cycle: Third cycle, doctoral program course
Doctoral programme subject: Economics

Purpose:

The Doctoral Mathematics for Economics course is designed to help students be prepared for the mathematical material found in the economics and statistics courses of a doctoral programme in economics.

Intended learning outcomes:

On completion of the course, the students will be able to:

Knowledge and understanding

1. indicate economic or statistics information that is transmitted by mathematical derivations.

Skills and abilities

2. demonstrate the capacity for mathematical analysis of economic relationships that have a broad use for decision making (for example, equilibrium and disequilibrium, stability, expectations and surprises, systems and dynamics, and the relevance of marginal considerations, bifurcations).
3. determine equilibria in dynamic system, whether each of those equilibria is stable or unstable, and how the dynamic system behaves outside of equilibrium, including situations with cyclical behavior and situations with chaotic behavior.
4. perform static constrained optimization and determine whether that optimization leads to maximization or minimization given the constraint(s).
5. perform standard operations on matrices, such as addition, multiplication, inversion, and finding eigenvalues and eigenvectors.
6. find solutions to dynamic systems of difference and differential equations, or to higher-order difference and differential equations, including those that involve complex eigenvalues or characteristic roots.
7. Perform dynamic optimization.

Judgement and approach

8. carry out mathematical derivations within the mathematical material covered with sufficient thoroughness to avoid largely unnecessary mistakes given time constraints.

Content:

- The contents of this course include
- (i) Matrix algebra: addition, multiplication, and inversion of matrices, eigenvalues
- (ii) Constrained optimization with inequality constraints
- (iii) The envelope theorem
- (iv) Difference equations and differential equations, including higher-order ones
- (v) Linear dynamic systems, including representations of cyclical behavior
- (vi) Chaos
- (vii) Dynamic Optimization
- (ix) Taylor series expansions

Type of Instruction/Teaching format:

Lectures and homework assignments.

Prerequisites:

Admitted to a doctoral programme in economics.

Examination and grades:

The examination consists of three written examinations, with their contributions to the final overall grade noted in parentheses below:

- Midterm examination (10%), which covers ILOs 1, 2, 3, 4, 8
- Final examination I (55%), which covers ILOs 2, 3, 4, 5, 6, 8
- Final examination II (35%), which covers 2, 3, 5, 6, 7, 8

To pass the course, students must be able to score at least 60% correct on the overall grade, and at least 60% correct on Final examination II.

The grades for the course is pass or fail.

Course evaluation:

A course evaluation will be conducted at the end of the course.

Additional information:

The course language is English.

Literature:

Chiang, Alpha C. and Wainwright, Kevin C. (2005) *Fundamental Methods of Mathematical Economics 4th edition*, McGraw Hill [ISBN: 007-123823-9]

Supplementary material may also be assigned.