COURSE SYLLABUS

Doctoral course: Mathematics for Doctoral Economics I, 7,5 credit points

Course code:
Reviewed by: RFB
Approved by:
Valid as of:
Version: 1
Reference number:

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

Purpose:

The *Mathematics for Doctoral Economics I* course is designed to help students be prepared for the mathematical material typically found in the economics (especially microeconomics) and statistics courses associated with 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 covered in this course.
2. demonstrate an understanding of topological definitions and theorems, in particular fixed point theorems.

Skills and abilities

3. perform static unconstrained and constrained multivariable optimization and determine whether that optimization leads to maximization or minimization given the constraint(s).
4. apply the envelope theorem.
5. apply calculus rules that involve log or exponential functions.
6. determine vector spaces for sets of vectors.
7. solve sets of simultaneous equations using matrix algebra.
8. find eigenvalues for square matrices and demonstrate their use in optimization or in statistics.
9. derive statistical functions and measures from continuous probability density functions, e.g. joint distributions, marginal distributions, expectations and variances.

Judgement and approach

10. 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) constrained optimization with inequality constraints

(ii) the envelope theorem

(iii) calculus rules involving logs and exponentials

(iv) addition, multiplication, and inversion of matrices; vector spaces; solving sets of simultaneous equations using matrices; and eigenvalues and eigenvectors

(v) unconstrained and constrained multivariable optimization

(vi) Taylor series expansion

(vii) the derivation of statistical functions and measures from continuous probability density functions

(viii) concavity, convexity, quasi-concavity, and quasi-convexity characteristics of functions

(ix) topological definitions and theorems, in particular fixed point theorems

Type of Instruction/Teaching format:

Lectures and homework assignments.

Prerequisites:

Admitted to a doctoral programme in economics or a related subject of a recognized business school or university.

Examination and grades:

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

- Midterm examination (20%), which covers ILOs 1, 4, 5, 9, 10
- Final examination (80%), which covers ILOs 1, 2, 3, 6, 7, 8, 10

To pass the course the student needs to achieve at least 60% correct of the maximum possible points on the final overall grade.

Course evaluation:

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

Additional information:

The course language is English.

Literature:

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

The course also uses material from Sydsaeter, K., Hammond, P., Seierstad, A. and A. Strom (2008) *Further Mathematics for Economic Analysis*, 2nd ed, Pearson [ISBN: 978-0-273-71328-9], including chapters 13 and 14, and Appendix A.

Supplementary material may also be assigned.