Mathematics and economic modelling

Lecturers
Thomas DEMUYNCK (Coordinator), Bram DE ROCK and Luca Paolo MERLINO

Course mnemonic
MATH-S400

ECTS credits
5 credits

Language(s) of instruction
English

Course period
First term

Campus
Solbosch

Course content

The course covers the following topics:

> Basic introduction into logic and proofs.

> What are the different proof techniques, how and when to apply them.

> Introduction into real analysis; supremum and infimum, sequences, limits, Cauchy sequences, subsequences, open, closed and compact sets

> Extreme value theorem & intermediate value theorem,

> Correspondences, upper and lower hemi-continuity

> Berge's maximum theorem.

> Fixed point theorems:

>> Contraction mappings,

>> Sperner's lemma and Brouwer's fixed point theorem

>> Existence of general equilibrium in an exchange economy,

>> Kakutani's fixed point theorem

>> Existence of Nash equilibrium.

Objectives (and/or specific learning outcomes)

The main goal of this course are:

> Provide the student with some necessary mathematical skills to pursue more advanced courses in economics.

> Improve the technical skills in the areas of (real) analysis, optimization and fixed point theory, wich are used in theoretical economics.

> Make sure students understand verify and construct proofs.

Pre-requisits and co-requisits

Required knowledge and skills

The course is self contant but has a rapid pace. It is adviced that students have some prior knowledge in terms of mathematics and real analysis in particular.

Teaching method and learning activities

> Lectures

> Podcasts of the main proofs are available on the website

> Exercise sessions

> Q&A sessions at the end of the semester

> Assignments.

Contribution to the teaching profile

Mastering the theoretical tools used in economics such that the student can use them for his/her own research. Knowledge of the essential mathematical tools used in contemporary economic research. Select and apply the theoretical tools of economics to specific problems in order to provide relevant solutions. Be able to understand and follow a proof.

The learning objectives relevant for the MATH-S400 course are:

> LO1.2: Identify and apply the relevant analytical tools and scientific knowledge to analyse an economic problem in depth

> LO2.1: Adopt a scientific approach to data collection, research and analysis and communicate results with clear, structured and sophisticated arguments

References, bibliography and recommended reading

[1] Chiang, A.C. and K. Wainwright, "Fundamental Methods of Mathematical Economics", Economic series, McGraw-Hill.

[2] MasCollel, A., M. Whinston and J. Green, "Microeconomic theory", Oxford university press. (Appendix)

[3] Simon, C.P. and L. Blume, "Mathematics for economists", Norton.

[4] Vohra, R., "Advanced Mathematical Economics" Routledge advanced texts in economics and finance.

Course notes

Podcast, Syllabus and Université virtuelle

Other information

Place(s) of teaching

Solbosch

Contact(s)

Thomas Demuynck (thomas.demuynck@ulb.be)

Evaluation method(s)

Other

Evaluation method(s) (additional information)

The exam is a written open book exam. Various assignments (usually 4) are given throughout the semester.

Determination of the mark (including the weighting of partial marks)

90% (written exam); 10% (exercises; provisionary).

Main language(s) of evaluation

English

Programmes

Programmes proposing this course at the Solvay Brussels School of Economics and Management

MA-ECOE | Master in Economics : Econometrics | finalité Research in Economics/unit 1 and MA-ECON | Master in Economics : General | finalité Economic Governance and Public Policy in Europe/unit 2

Programmes proposing this course at the Brussels School of Engineering

MA-IRPH | Master of science in Physical Engineering | finalité Professional/unit 2