

The role of mathematics for students in economics at SBS-EM

Bram De Rock and Marjorie Gassner

Motivation:

Since 2007 Bram De Rock and Marjorie Gassner are jointly responsible for all of the mathematics courses for students in Economics at the SBS-EM. The four courses concerned are the following.

MATH-S-101 – Mathématique Générale: analyse et algebra linéaire, 10 ECTS, 48 hours (plus 48 hours taught by teaching assistants).

MATH-S-201 – Mathématique: fonctions de plusieurs variables, 5 ECTS, 24 hours (plus 24 hours taught by teaching assistants).

MATH-S-400 – Topics in Mathematics, 5 ECTS, 72 hours.

MATH-S-401 –Dynamic Optimization, 5 ECTS, 48 hours.

This document states our **integrated vision** on the role of mathematics for our students. As we explain below, this vision is based on our training as mathematicians as well as our experience in doing research in economics. We strongly believe that the four mathematics courses, and our corresponding vision, are essential for the students to reach the standards spelled-out in the **mission statement of SBS-EM**.

Objectives:

- (1) Mathematicians are trained to be experts in carrying out logical reasoning. To become such an expert it is crucial to be able to study problems in an abstract way and to understand the importance of the underlying assumptions. Mathematicians are drilled during several years to acquire an attitude of critical and abstract thinkers.

Both trained as mathematicians, we want to confront our students in economics with this *mathematical way of life*.

If our students are to become our political and economic leaders, if they will have to respond to economic and business challenges and/or if we want them to be able to produce research “at the frontier”, then it is crucial that they are able to analyze their problem at hand in a *logical and consistent way* and that they understand the importance and consequences of their chosen assumptions.

- (2) Economists are trained to understand the intuition of real-life observations and to translate this intuition into models to understand these observations and to predict the outcome in new situations.

In this respect, mathematics can help the economist *to run instead of walk*.

That is, mathematical tools and rigorous notation extend the possibilities of the model builder, since they allow to describe phenomena in a more abstract and powerful way. This implies that the claims made by the models are verifiable. It also makes the models more flexible with respect to new situations and increases the exactness and relevance of the obtained implications.

We provide our students with a selection of essential mathematical tools, illustrate their relevance by economic applications and emphasize the importance of proving the results obtained by the models. The selection of tools and applications is based on our own research in economics and on discussions with our SBS-EM colleagues.

Integrated view:

In all of the four courses we focus on these two objectives by introducing mathematical tools in a consistent way.

We refuse to provide the students with a *cook book* of mathematical tools.

Instead we focus on the bigger picture in order to explain the intuition and relevance of the concepts under study. Throughout the four courses we study the proofs and intuition of the important results in order to train the students in logical and abstract reasoning.

MATH-S-101 and MATH-S-201: introduce to mathematics for economists
MATH-S-400 and MATH-S-401: deepen mathematical knowledge

In the bachelor courses we use this approach to give the students a broad introduction to the mathematics that students in economics need to study their courses in economics.

In the master courses, we deepen this knowledge by discussing specialized optimization tools and by training the students in applying the *mathematical way of life* to some research questions in economics.