

**Master in International Economics (MA-EI)  
MAS in Sustainable Finance and Development (MASF)**

Academic year 2023-2024

**MATHEMATICS AND STATISTICS FOR ECONOMISTS**

*Draft Syllabus version 2. The final version of the syllabus will be available in early August 2023.*

**EI071 – Autumn Semester**

**Course Description**

The aim of the course is to give the incoming Master students in International Economics (MA-IE) the necessary mathematical and statistical skills to begin the core first-year courses. We will go over basic matrix algebra, analysis, optimisation, probability and statistics. An introduction to the different software needed, such as LaTeX and Stata, will also be given. This **three-week course** consists of daily lectures and problem-solving sessions designed to bring students from heterogeneous academic backgrounds up to speed in terms of the quantitative methods used in economics. The course is compulsory for Master students in International Economics (**MA-IE**) – 6 ECTS – and is optional for the MAS students in Sustainable Finance and Development (**MASF**) – no ECTS.

**› INSTRUCTOR**

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**Syllabus****Pre-requisites (for both MA-IE and MASF students)**

The material covered is at an intermediate bachelor-master level. **A basic undergraduate knowledge of mathematics and statistics is of course needed**, but the purpose of the course is also to refresh this knowledge, in particular for students who graduated a few years ago. The course is compulsory for Master students in International Economics (**MA-IE**) – 6 ECTS – and is optional for the MAS students in Sustainable Finance and Development (**MASF**) – no ECTS.

**Organisation**

The course will be organised from Monday 21 August to Friday 8 September 2023 (3 weeks before the start of the first semester).

The lectures will take place as follows:

- Week 1 (21/08 – 25/08): mornings and afternoons
- Week 2 (28/08 – 01/09): mornings
- Week 3 (04/09 – 08/09): mornings
- Additional week before the start of the Spring Semester (tbc)

## Grading (for MA-IE students only)

Please note that a pass/fail grading system will apply for this course. The grading will be based on your participation in the course, on group work (problem sets) and on a final examination. Students who will not be able to attend the entire course should contact the Instructor as soon as possible.

## Content of the course

### 1) Linear Algebra

- System of linear equations
- Matrix algebra
- Some specific matrices
- Determinant, rank and inverse of a matrix
- Eigenvalues, eigenvectors
- Kronecker product

### 2) Mathematical analysis

- Differentiation
- Maxima and minima
- Convexity and concavity
- Exponential and logarithmic functions
- Log-linearization

### 3) Optimisation

- Functions of several variables
- Implicit relations
- Optimisation with several variables
- Constrained optimisation
- Envelope theorem
- Inequality constraints
- Dynamic optimisation in discrete time
- Dynamic optimisation in continuous time

### 4) Probability and statistics

- Introduction
- The probability set function
- Conditional probability and independence
- Random variables
- Selected probability distributions
- Large sample theory
- Introduction to hypothesis testing

## Main reference:

- Simon, C. P. and Blume, L. (1994): Mathematics for Economists

## Other useful references:

- Anton, H. (1987): Elementary Linear Algebra
- Glaister, S. (1984): Mathematical Methods for Economists
- Pemberton, M. and Rau, N. (2016): Mathematics for Economists: An Introductory Textbook
- Sydsaeter K., Hammond P. and Strom A. (2012): Essential Mathematics for Economic Analysis.
- Hogg, R., McKean, J. and Craig, A. (2018): Introduction to Mathematical Statistics