

Pre-master Econometrics and Operations Research

Extended Motivation Letter

Starting the SBE pre-master Econometrics and Operations Research (E&OR) requires a substantive quantitative background as the courses in the pre-master build on knowledge of topics in various areas in mathematics. **For this purpose, the Board of Admission will only admit students to the pre-master that are considered to have sufficient mathematical background and motivation to successfully complete the pre-master.**

Therefore, please elaborate in your motivation letter on your mathematical pre-knowledge. This can be done by highlighting the quantitative courses in your previous study programme, explaining the content of these courses by adding course descriptions and literature used.

It is possible to successfully complete the SBE pre-master E&OR if there are some gaps in the mathematical background. Note though that this will require a lot of motivation and efforts to catch up. Ideally, applicants catch up before the start of the pre-master. If you have deficiencies in your background, you should convince the Board of Admission of your motivation to catch up in your motivation letter.

If you have questions about the motivation letter or the prerequisites, please contact Stephan Smeekes, programme leader of the MSc E&OR: s.smeekes@maastrichtuniversity.nl

Prerequisites

On the next page, we give an overview of recommended background knowledge before the start of the SBE pre-master E&OR. **Please use this list for a self-assessment of any deficiencies and to prepare for your motivation letter.**

The level of urgency indicates how essential the knowledge is for your performance in the pre-master:

- **Low urgency:** possessing knowledge about this subject, will help you go through the pre-master smoothly. Without his knowledge, successful completion of the pre-master is still possible, but will require more effort, and possibly some catching up during the courses.
- **Medium urgency:** this knowledge is required to successfully complete the pre-master, but not necessarily at a deep level. It is highly recommended that you familiarize yourself with these subjects before the start of the programme, focusing on understanding the basic concepts. If you are familiar with this subject on a basic level, and know where to find the more advanced parts, it is possible (but requires effort) to catch up during the programme.
- **High urgency:** it is crucial that you study these subjects thoroughly before the start of the programme. Without this knowledge, it will be very difficult to successfully complete your pre-master. Note that superficial awareness of these topics is not sufficient, but proper understanding is needed.

Calculus (Urgency: *medium*, but basic knowledge is typically already there)

Basic knowledge about differentiation and integration, optimizing functions of one or multiple variables, limits and sequences, is needed throughout the pre-master. Such topics will be covered in most standard mathematics courses for economics programmes. You may also want to consult this online course: <https://ocw.mit.edu/courses/res-18-005-highlights-of-calculus-spring-2010/>

The following online book can also be useful (particularly chapters 2-6, 8.4, 10, 11 and 13): <https://ocw.mit.edu/courses/res-18-001-calculus-fall-2023/>

Linear Algebra (Urgency: *medium* for the basics / *low* for deeper knowledge)

The pre-master course Econometric Methods I requires some basic knowledge of matrix algebra. In particular, basic knowledge about matrix multiplication, matrix inverses, orthogonality and projections is very useful. These topics can for example be found in this online course: <https://ocw.mit.edu/courses/18-06sc-linear-algebra-fall-2011/>

Note that the course covers more than is needed. This book - associated with the course - may also be useful: <https://math.mit.edu/~gs/linearalgebra/ila6/indexila6.html>

Probability Theory (Urgency: *high*)

Probability theory is the topic we most often see deficiencies in, and the most crucial, in particular for the course Mathematical Statistics in the pre-master. Addressing these deficiencies before the start of the pre-master is highly recommended.

The course follows up on the first-year BSc E&OR course the course Probability Theory ([EBC1024](#)), in which in Chapters 1-5 of the book *Statistical Inference* by Casella and Berger are covered (Mathematical Statistics starts with Chapter 6).

Equivalently, one could study up to topic 31 of this online course: <https://ocw.mit.edu/courses/18-440-probability-and-random-variables-spring-2014/pages/readings/>

Optimisation (Urgency: *medium* for linear, *low* for nonlinear)

Introductory knowledge of linear and nonlinear programming, on the level of the course Optimisation ([EBC2105](#)), will be quite helpful. Also see this online course: <https://ocw.mit.edu/courses/15-053-optimization-methods-in-management-science-spring-2013/>

Programming (Urgency: *low*)

Programming will be used in some of the courses in the pre-master, and even more extensively in the master itself. Having some prior knowledge about programming is therefore highly beneficial. In the course Programming ([EBC2016](#)) the following book is used:

<https://greenteapress.com/wp/think-java-2e/>

Chapters 1-8 are particularly relevant (EBC2016 studies up to Chapter 12).