

# MA120 Mathematics for Economics

## (Fall 2023)

Seminar Leader: Stephan Müller

Course Times: Mo, Wed 15:45-17:15

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**IMPORTANT: This course is only open to students who took last year's Maths for Social Sciences class (Spring 2023) or for students who tested out of the first Maths class in the economics sequence in Spring 2023.**

### Course Description

This course focuses on the mathematical tools important for the study of economics: analytic geometry, functions of a single variable, functions of two variables, calculus, integrals and linear algebra (matrices, determinants, systems of linear equations and methods for solving them). A large part of the course will deal with optimization in one or more variables and its corresponding applications in economics (e.g. utility and profit maximization problems). The course will also be of interest for any student with a general interest in mathematics, or who does not intend advanced specialization in economics, but wishes to become informed regarding the essential mathematical building blocks of economics as a discipline.

### Learning Outcomes

- Mastery of basic mathematical knowledge and its application to economics
- Ability to understand and participate in debates on the uses of mathematics in economics
- Capacity to complete exercises and projects proper to mathematical analysis or its use in economics

### Requirements

#### Textbook

For this course, we will use the textbook "Maths for Economics" by Geoff Renshaw (4<sup>th</sup> edition, 3<sup>rd</sup> edition will work as imperfect substitute) and required readings/exercises will mostly be from this book. It is vital for your success in the course that you prepare our sessions by carefully studying the assigned parts of the textbook and that you carefully do the exercises provided in class and the book. Mathematics is not a topic that is easily understood by just browsing through the readings but requires the actual use of the concepts discussed in class. **To be successful, you will need to practice maths continuously and do many more of the exercises than we can actually do together in class.** Because of this importance of exercising, an essential part of the grade will be based on the exercises given throughout the course.

#### Attendance

Attendance at ALL classes is expected. More than two absences (that is absences from two sessions of 90 minutes) in a semester will significantly affect the grade for the course.

#### Assessment

Assessment will be based on attendance, preparation for classes, regular and active participation, professionalism (see below), quizzes, exercises as well as a midterm (60 minutes) and final examination (90 minutes). The worst-graded quiz and exercise will not count towards the grade.

### **Policy on Late Submission of Exercises**

Exercises that are up to 24 hours late will be downgraded one full grade (from B+ to C+, for example). After that, we will accept late submissions only until the end of the week in which they were due (Sun, 23:59), but these cannot receive a grade of higher than C. Thereafter, the student will receive a failing grade for the assignment.

### **Use of cell phones**

The use of cell phones is not allowed during the classes. Please leave your cell phone in your bag during the classes.

### **Grade Breakdown**

Seminar preparation, professionalism and participation 20%

Quizzes and exercises 20%

Midterm examination 30%

Final examination 30%

### **Schedule**

Classes start on Monday Sep 4 and run until Wednesday Dec 13, with fall break planned for Oct 23 – Oct 27. Completion week is from Dec 18 until Dec 22. **Attendance is mandatory during completion week. In principle, all students are required to stay in Berlin during completion week.**

Scheduled class times are available online under the relevant course heading:

<https://berlin.bard.edu/academics/courses/>

The schedule provided is provisional in order to allow for flexibility. It is the students' responsibility to keep themselves informed of any changes to the schedule provided here. An up-to-date schedule will be maintained by the course management on the internet in Google classroom. The password to join google classroom will be handed out in class.

We start out with a brief recap of the basics and then go into less familiar topics. After the introductory weeks we look into optimization problems with two variables, which are relevant in the context of modelling utility or production functions and solving the consumer's utility maximization problem, we make a detour and deal with topics such as matrix algebra and integration (used for instance to derive consumers' surplus). Finally, we look into the mathematics of growth and finance (compound growth, calculating net present values etc.).

Class sessions will generally consist of three parts: Exposition of mathematical concepts and techniques, exercising their use as well as a discussion of their use in economics via examples where appropriate.

	Topic	Reading
Week 1 Sept 4 & Sept 6	Introduction and Recap from previous maths class including some economic applications	Renshaw, Chs. 1-3
Week 2 Sept 11 & Sept 13	Recap: Linear equations, quadratic functions	Renshaw, Chs. 3-5
Week 3 Sept 18 & Sept 20	Recap: Derivatives	Renshaw, Chs. 6-8
Week 4 Sept 25 & Sept 27	Economic applications of functions and derivatives; Elasticity	Renshaw, Chs. 8-9
Week 5 Oct 2 & Oct 4	Optimization in two or more independent variables I	Renshaw, Ch. 14
Week 6 Oct 9 & Oct 11	Optimization in two or more independent variables II	Renshaw, Chs. 14-15
Week 7 Oct 16 & Oct 18	Midterm and optimization continued <i>mid-term is Oct 16, during class hours</i>	Renshaw, Chs. 15-16
Oct 23 & Oct 25	Fall break	
Week 8 Oct 30 & Nov 1	Optimization: Implicit differentiation; Economic applications	Renshaw, Ch. 16
Week 9 Nov 6 & Nov 8	Economic applications continued; Matrix Algebra I	Renshaw, Chs.16, Ch. 19
Week 10 Nov 13 & Nov 15	Matrix Algebra II	Renshaw, Ch. 19
Week 11 Nov 20 & Nov 22	Integration	Renshaw, Ch. 18
Week 12 Nov 27 & Nov 29	Financial math basics	Renshaw, Ch. 10
Week 13 Dec 4 & Dec 6	Mathematics of finance and growth I, continued	Renshaw, Chs. 10-11
Week 14 Dec 11 & Dec 13	Mathematics of finance and growth II; Review	Renshaw, Chs. 12-13
Week 15 Completion week	FINAL EXAMINATION: tba.	

### Exercise Deadlines

Exercises are due before class one week after being given. Those exercises will be given throughout the course where appropriate and constitute an integral part of the final grade.

### Professionalism

Being a student is your full-time job and with it come a set of responsibilities and expectations, as with any other job. Maintaining a professional attitude towards your course of study is something that also prepares you for later work life. A professional attitude towards your studies is shown by coming to class on time, being prepared, being courteous to your teachers and fellow students. It is exhibited by writing your essays with care, actively participating in class, avoiding distractions (excessive bathroom breaks, using smartphones to check on irrelevant issues during class etc.), not missing

classes except for the most dire of circumstances and in general by adapting to the rules of the course without trying to bargain for personal exceptions.

### **Ethics/Academic honesty**

A core value of the academy is truth and the pursuit thereof. Nothing can shake the foundations of this pursuit as much as academic dishonesty as it undermines the trust that is indispensable to it. This is why I will not excuse any instance of academic dishonesty. Plagiarism, cheating during exams, copying homework assignments (or doing individual assignments with a classmate) all constitute violations of academic honesty and of the clause on “academic integrity” that each student has signed in the student handbook. They can lead to failing the course and will be reflected in the student’s record (having a record of academic dishonesty can make obtaining scholarships, achieving a study abroad place or admission to another program difficult if not outright impossible). If students fail to meet the expected standards of academic integrity, this will be dealt with under the Code of Student Conduct, Section III Academic Misconduct.

*Classes missed due to federal holidays will not be rescheduled.*

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