MA120 Mathematics for Economics

Seminar Leader: Marcus Giamattei
Course Times: Mon and Wed 15.45-17.15
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IMPORTANT: This course is only open to students who took last year's Mathematical Foundations class (Spring 2022 or earlier) or for students who tested out of Mathematical Foundations .

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 (4th edition) 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 a crucial part of the education offered by Bard College Berlin and therefore mandatory. Students may be excused if circumstances outside of their control prevent their attendance (e.g. illness, appointment with a government office). These cases are excused if notification is given via email <u>before</u> the course. The instructor may require additional documentation in case of absences or frequent exams/quizzes on the day of absence.

Bard College Berlin does not offer credit for any course in which a student has missed more than 30% of classes, regardless of the reasons for the absences, whether excused or

unexcused.

The full Bard College Berlin attendance policy can be found in the Student Handbook, Section 2.8.

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 or home exercise will not count towards the grade.

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.

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.

Grade Breakdown
Seminar preparation, professionalism and participation 20%
Quizzes and home exercises 20%
Midterm examination 30%
Final examination 30%

Schedule

Fall classes start on Monday, August 29 and run until Friday, December 16 with fall break planned from
October 24 – October 28. Completion week is from December 12 through December 16. Students are
required to be on campus during completion week.

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 (Renshaw)
Week 1	Introduction and recap basic concepts	Chs. 1-5
Week 2	Recap: Derivatives and Derivatives in Action	Chs. 6-8
Week 3	Optimization in two or more independent variables Partial derivatives	Chs. 14.1-14.6
Week 4	Unconstrained optimization and total differential	Chs. 15.1-15.4
Week 5	Constrained optimization	Chs. 16.1-16.4
Week 6	Constrained optimization continued Economic applications (utility function and production function)	Chs. 16.1-16.5 Chs. 14.7-14.13
Week 7	Midterm and economic applications continued _mid-term, during class hours_	Chs. 15.10-15.13
Week 8	Matrix Algebra	Ch. 19
	Fall break	
Week 9	Matrix algebra continued Mathematics of finance and growth I – Geometric series	Ch. 19 Ch. 10
Week 10	Mathematics of finance and growth II – Present value	Ch. 10
Week 11	Mathematics of finance and growth III – Bond valuation Exponential function and logarithm	Additional reading Ch. 11-12
Week 12	First-order difference equations	Ch. 20
Week 13	First-order difference equations continued	Ch. 20
Week 14	Integration; Review and final exam	Ch. 18
	FINAL EXAMINATION: tba	

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.

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