Syllabus

MA Math Camp 2021

Department of Economics, Columbia University

Last Updated : May 24, 2021

Course Information

- Instructor : César barilla

- Email : cesar.barilla@columbia.edu

- Graders : Utkarsh Kumar and Akanksha Vardani

- Course Website : `https://cesarbarilla.github.io/Columbia-MA-Math-Camp-2021`

- Dates : Monday Aug. 16 - Thur Sep. 2

- Time : 9:30am-12:00pm

- Place : Room TBA and on Zoom (Link and recordings will be shared)

- Office Hours : TBA

- Problem Sets : TBA

- Exam : TBA

Course Description

The course will cover the mathematical tools and concepts required for the first year sequence of the Master's in Economics. The main goal of the course is to prepare for first year classes by reviewing or introducing fundamental concepts in various domains of mathematics – analysis, linear algebra, calculus, probability, optimization. A strong emphasis will be put on proof-writing skills and proper mathematical rigor, as well as problem-solving and application of the tools. Students are expected to have taken courses in elementary analysis and unidimensional calculus, as well as have some familiarity with concepts in probability and linear algebra.

The class will be taught in a hybrid format from Monday August 16th to Thursday September 2nd. Lectures will be held in person (room TBA) every weekday from 9.30am to 12pm EST ; they will simultaneously be available on Zoom as well as recorded for asynchroneous attendance. If possible, students are strongly encouraged to attend the lectures in real time.

The course is largely self-contained. Lecture notes will be posted on the website ; teaching itself will mostly take place on the blackboard but additional notes or slides might be provided. Some additional notes and textbook references are provided below.

Problem sets will be assigned weekly. They are important practice and will be graded for feedback, although no grade will be given for the class. Problem sets will have to be submitted online (modalities to be specified) and will have to be typed – LaTeX is very strongly encouraged as it is an extremely valuable skill that students should acquire as soon as possible. There will be a final exam – the date and modality of the exam will be announced later.

Course Material

Course Outline and Lecture Notes

Here is a tentative course outline :

1. Introduction to Set Theory and Mathematical Logic

2. Real Analysis

3. Linear Algebra

4. Multivariate Calculus

5. Convexity

6. Optimization

7. Probability

Lectures notes will be posted on the website

Problem Sets

Problem sets will be posted on the website.

References and Textbooks

Two very useful short introductions to mathematical proofs.

Lecture notes from last year's math camp are available at `https://github.com/CesarBarilla/Columbia-MA-Math-` `tree/main/2020%20Lecture%20Notes`.

Some useful textbooks and other references include (in no particular order) :

- Knut Sydsaeter, Peter Hammond, and Andrés Carvajal. "Esssential mathematics for economic analysis.", 5th Edition, (2008).

- Knut Sydsaeter, Peter Hammond, Atle Seierstad and and Arne Strøm. "Further mathematics for economic analysis.", 2nd Edition, (2008).

- Rudin, Walter. "Principles of Mathematical Analysis (International Series in Pure & Applied Mathematics)." (1976).

- Treil, Sergei. "Linear Algebra Done Wrong." (2014) (available for free online at `http://www.math.brown.edu/treil/papers/LADW/LADW-2014-09`)

- Lang, Serge. "Linear Algebra. Undergraduate texts in mathematics." (2004).

- Sundaram, Rangarajan K. "A First Course in Optimization Theory." (1996).

- Ok, Efe A. "Real Analysis with Economic Applications." (2007).

- Of, Efe A. "Measure and Probability Theory with Economic Applications". Available online at `https://sites.google.com/a/nyu.edu/efeok/books`

- Stokey, Nancy L., Robert E. Lucas Jr, and Edward C, Prescott. "Recursive Methods in Economic Dynamics." (1989).

- Wälde, Klaus, "Applied Intertemporal Optimization" (2020), available online for free at <https://www.macro.eco mainz.de/klaus-waelde/waelde-klaus-applied-intertemporal-optimization/>