

# MATHEMATICAL METHODS FOR SOCIAL SCIENCE

Summer 2022

## Course Information

- **Instructor** Kisoo Kim ([kisoo@uchicago.edu](mailto:kisoo@uchicago.edu))
- **Class Meeting** We will meet daily 9:30 - 11 am at Keller Center (Classroom to be announced) through Aug. 29th - Sep. 16th, except for weekends and Labor Day. The lectures will be broadcast on Zoom synchronously.
- **Office Hour** By appointment.
- **Teaching Assistant:** Steve Kim ([kimsy@uchicago.edu](mailto:kimsy@uchicago.edu))
- **TA Review Session:** 11:30 am - 12:30 pm at Keller Center. The sessions will also be broadcast on Zoom synchronously. We will not have a TA review session on the first day (Aug. 29th).

**Overview** This course aims to prepare students to succeed in the Harris PhD core courses, and provide a foundation for further studies. The course aims to provide a self-contained material.

**Plan** The course covers topics relevant to the study of applied economic theory and econometrics, following the tentative course outline below. The outline is subject to change.

Logic and Proofs .....	Day 1
Mathematical Preliminaries .....	Day 2
Calculus 1 .....	Day 3
Calculus 2 .....	Day 4
Real Analysis 1 .....	Day 5
Real Analysis 2 .....	Day 6
Real Analysis 3 .....	Day 7
Linear Algebra 1 .....	Day 8
Linear Algebra 2 .....	Day 9
Linear Algebra 3 .....	Day 10
Optimization 1 .....	Day 11
Optimization 2 .....	Day 12
Probability and Statistics 1 .....	Day 13
Probability and Statistics 2 .....	Day 14

Homework will be distributed after each lecture, but it is not for submission nor grading. The solution will be discussed in the TA sessions.

**References** The course material consists of an eclectic collection from the following list.

- Çınlar, Erhan and Robert Vanderbei, *Real and Convex Analysis*, Springer, 2012.
- Jehle, Geoffrey and Philip Reny, *Advanced Microeconomic Theory*, Addison Wesley Longman, 2nd ed. 2001.
- Ok, Efe, *Real Analysis with Economic Application*, Princeton, 2007.
- Denlinger, Charles, *Elements of Real Analysis*, Jones and Bartlett, 2011.
- Rudin, Walter, *Principles of Mathematical Analysis*, McGraw-Hill, 1976.

- Axler, Sheldon, *Linear Algebra Done Right*, Springer, 2015.
- Friedberg, Stephen, Arnold Insel, and Lawrence Spence. *Linear Algebra*. 1989.
- Davidson, Russell, James MacKinnon, *Econometric Theory and Methods*, Oxford University Press, 2003.
- Stewart, James, *Calculus*, Brooks Cole, 2007.
- Simon, Carl, Lawrence Blume, *Mathematics for Economists*, Norton & Company, 1994.
- Mas-Colell, Andreu, Michael Whinston, Jerry Green, *Microeconomic Theory*, Oxford University Press, 1995.
- Sally, Paul, *Tools of the Trade*, American Mathematical Society, 2008.
- Casella, George, Roger Berger, *Statistical Inference*, Wadsworth, 2002.