

# MATHEMATICAL METHODS FOR SOCIAL SCIENCE

Summer 2021

## Course Information

- **Instructor** Kisoo Kim ([kisoo@uchicago.edu](mailto:kisoo@uchicago.edu))
- **Class Meeting** We will meet daily 9-10:30am at Keller Center 2112 through Aug. 30th - Sep. 17th except for weekends and Labor Day. The lectures will be broadcasted through Zoom synchronously. The lectures will be recorded and uploaded on Canvas.
- **Office Hour** By appointment.
- **Teaching Assistant:** Steve Kim ([kimsy@uchicago.edu](mailto:kimsy@uchicago.edu))
- **TA Review Session:** 8 - 9pm at Keller Center 2112. The sessions will be broadcasted through Zoom synchronously.

**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 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
Linear Algebra 1 .....	Day 7
Linear Algebra 2 .....	Day 8
Optimization 1 .....	Day 9
Optimization 2 .....	Day 10
Probability and Statistics 1 .....	Day 11
Probability and Statistics 2 .....	Day 12
Linear Regression and Causal Inference .....	Day 13
Microeconomics and Game Theory .....	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's review sessions.

## References

The course material consists of 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.