

University of Mannheim
School of Social Sciences
Chair of Political Economy

Dr. Anna-Sophie Kurella
anna.kurella@mzes.uni-mannheim.de

Mathematics for Political Science

Syllabus Fall 2017

Course Description

This course is designed to provide mathematical tools useful for the rest of your Master program in Mannheim, especially for the upcoming, mandatory courses in statistics and game theory. The course reviews some mathematical concepts most of you will be familiar with from high school. We will cover fundamentals in set theory, uni- and (partially) multivariate calculus, linear algebra and probability theory. Each day consists of lectures and exercise sessions. The course's objective is to make students familiar and comfortable reading mathematical statements and applying various mathematical techniques.

Attendance Policy

While the instructor strongly encourages attendance, this course is voluntary. If you decide to participate I expect you to attend the class actively and full time each session.

Schedule

Date	Day	Time	Room
28.08.	Monday	2-5.15pm	B 317, A5, 6 Bauteil B
29.08.	Tuesday	9.15-5.15pm	B 317, A5, 6 Bauteil B
30.08.	Wednesday	9.15-12.30am	B 317, A5, 6 Bauteil B
31.08.	Thursday	9.15-5.15pm	B 317, A5, 6 Bauteil B
01.09.	Friday	9.15-12.30pm	B 317, A5, 6 Bauteil B

- Introduction
- Calculus I
 - Set Theory, Relations, Functions, Limits
- Calculus II
 - Differentiation, Optimization
- Calculus III
 - Integration, Sequences, Series, Approximations
- Linear Algebra I
 - Linear Combinations, Vector Spaces
- Linear Algebra II
 - Matrices, Matrix Operations, Determinants, Eigenvalues
- Probability I
 - Combinatorics, Bayes' Rule
- Probability II
 - Distributions

Readings

Here are some recommended readings. You are not required to read all of those books prior to class.

- General
 - Moore/Siegel (2013) *An introductory mathematics course aimed at social scientists, provides good intuitions for basic concepts and applications. It has accompanying video lectures on Youtube.*
 - Simon/Blume (1994) *A comprehensive treatment of mathematics for students of economics for both undergraduate and more advanced level.*
 - Sydsaeter/Hammond (2008) *Another standard mathematics textbook for economics undergraduates.*
- Calculus
 - Spivak (2006) *A classic standard textbook for a first class in Calculus for mathematics students at undergraduate level.*
 - Protter/Morrey (1991) *A typical theorem-proof book that covers introductory real analysis for mathematics students at undergraduate level. Short and to the point.*
- Linear Algebra

- Lay (2011) *A standard introduction for mathematics undergraduates.*
 - Strang (2005) *Another standard introduction for mathematics undergraduates. Strang's MIT video lectures accompanying the textbook are available online for free.*
 - Hefferon (2014) *A theorem-proof style introductory book for mathematics undergraduates with lots of examples and interesting applications. It is free.*
 - Axler (2015) *A more rigorous but intuitive treatment of linear algebra for mathematics undergraduates.*
 - The Matrix Cookbook¹
An overview over some more advanced matrix calculus.
- Probability Theory
 - DeGroot/Schervish (2011) *A comprehensive standard treatment of probability and statistics for mathematics undergraduate students. Intuitive and (relatively) rigorous at the same time with lots of exercises.*

References

- Axler, S. (2015). *Linear Algebra Done Right* (3rd ed.). Undergraduate Texts in Mathematics. Springer.
- DeGroot, M. H. and M. J. Schervish (2011). *Probability and Statistics* (4th ed.). London: Pearson.
- Hefferon, J. (2014). *Linear Algebra*.
- Lay, D. C. (2011). *Linear Algebra and Its Applications*. London: Pearson.
- Moore, W. H. and D. A. Siegel (2013). *A Mathematics Course for Political and Social Research*. Princeton: Princeton University Press.
- Protter, M. and C. Morrey (1991). *A First Course in Real Analysis* (2nd ed.). Undergraduate Texts in Mathematics. Springer.
- Simon, C. P. and L. Blume (1994). *Mathematics for Economists*. New York: Norton and Company.
- Spivak, M. (2006). *Calculus* (3rd ed.). Cambridge University Press.
- Strang, G. (2005). *Linear Algebra and Its Applications* (4th ed.). Brooks Cole.
- Sydsaeter, K. and P. Hammond (2008). *Essential Mathematics for Economic Analysis* (3rd ed.). Essex: Pearson.

¹http://www2.imm.dtu.dk/pubdb/views/edoc_download.php/3274/pdf/imm3274.pdf