Fall 2010 - Thursday 09:00AM-11:50AM
Social Science Building, Room 104

Mathematical and Statistical Foundations

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Office Hours: Wednesday 10:00AM-12:00PM, office SSB #365.

It is quite common for political scientists to use mathematical techniques to describe and analyze political phenomena. Mathematics provides the foundations for empirical propositions about relationships between political variables. Political scientists typically transform raw data from the real world into numerical generalizations using statistics. The role of mathematics in political science, though, is not restricted to the domain of statistical technique. Many political scientists also construct mathematical representations of political institutions to understand better how they work. Building these formal model entails picking out the most important aspects of a situation and then trying to express them mathematically. Over the years, though, the mathematical demands of modern political science have scaled up considerably. The goal of this course is to give the students a deeper understanding of the mathematics they need to know to work with statistical and formal models.

The class will meet once a week for two hours and 55 minutes. Readings are drawn from two books available for purchase. Some basic knowledge of elementary calculus and probability theory is recommended, but it is not a requisite to take this class. There will be a final exam, as well as weekly problem sets. These problem sets will be due a week after they are circulated. The sum of the weekly assignments is worth 70% of the final grade and the final exam accounts for 20 % of the final grade. Attendance accounts for the remaining 10 %.

Required Textbooks

Carl P. Simon and Lawrence Blume. 1994. *Mathematics for Economists.* New York: Norton.

Y.A. Rozanov. 1977. *Probability Theory: A Concise Course.* New York: Dover.

Course Outline and Readings

Week 1 (September 23) - Sets, Numbers, and Proofs.
Simon & Blume, Appendix A1.

Week 2 (September 30) - One-Variable Calculus.
Simon & Blume, Chapters 2-5.

Week 3 (October 7) - Integral Calculus.
Simon & Blume, Appendix A4.

Week 4 (October 14) - Linear Algebra.
Simon & Blume, Chapters 6-11.

Week 5 (October 21) - Calculus of Several Variables.
Simon & Blume, Chapters 12-15.

Week 6 (October 28) - Optimization.
Simon & Blume, Chapters 16-21.

Week 7 (November 4) - Eigenvalues and Dynamics.
Simon & Blume, Chapters 23-25.

Week 8 (November 11) - Probability.
Rozanov, Chapters 1-3.

Week 9 (November 18) - Random Variables.
Rozanov, Chapters 4-7.

Week 10 (December 2) - Applications.
Simon & Blume, Chapter 22; Rozanov, Appendices I-II