PSC 404  
Probability and Inference  
Fall 2010  
3:25-4:40 T/Th  
Harkness 329

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PURPOSE
This course in mathematical statistics provides graduate students in Political Science with a solid foundation in probability and statistical inference. The focus of the course is on the empirical modeling of non-experimental data. While substantive political science will never be far from our minds, our primary goal is to acquire the tools necessary for success in the rest of the econometrics sequence. As such, this course serves as a prerequisite for the advanced Political Science graduate courses in statistical methods (PSC 405, 505, and 506).

PREREQUISITES
The math “boot camp” is the only course prerequisite, as familiarity with calculus is necessary to understand the material. Students who remain uncomfortable with differentiation and integration may want to consider sitting in on a calculus course offered elsewhere in the University.

COURSE REQUIREMENTS
Evaluation is based on homework assignments (10%), a midterm exam (40%), and a final exam (50%). In addition to office hours, the teaching assistant will hold a weekly recitation. Attendance is mandatory. The purpose of the recitation is to cover material not covered in lecture, to go over homework problems, and to review for exams. Students are responsible for material covered in lecture, recitation, and the required readings. A web page for this course is to be found at http://www.rochester.edu/College/PSC/clarke/404/404.html.

TEXT
The required texts for this course are:

COURSE SCHEDULE

Topic 0: Course Overview and Introduction to Empirical Modeling


Topic 1: Introduction to Probability

Reading: DS Ch. 1

Topic 2: Conditional Probability

Reading: DS Ch. 2

Topic 3: Random Variables and Distributions

Specifics: Random variables. PDFs and CDFs. Functions of random variables.
Reading: DS Ch. 3

Topic 4: Expectation

Reading: DS Ch. 4

Midterm. Covers topics 0-4.
Topic 5: Special Distributions
Specifics: Named distributions. Central limit theorem.
Reading: DS Ch. 5

Topic 6: Estimation
Specifics: Inference. MLE. Sufficient statistics. Improving an estimator.
Reading: DS Ch. 6

Topic 7: Sampling Distributions of Estimators
Specifics: Sampling distributions. \( \chi^2 \) and \( t \). Interval estimation. Fisher information.
Reading: DS Ch. 7

Topic 8: Testing Hypotheses
Reading: DS Ch. 8

Topic 9: Categorical Data and Nonparametric Methods
Specifics: Let’s cross this bridge when we come to it.
Reading: DS Ch. 9

Topic 10: Simulation
Specifics: Who are we kidding?
Reading: DS Ch. 11

Final Exam. Cumulative with weight on second half.