

# Undergraduate Courses in Quantitative Analysis, Political Economy, and Strategy in Politics

Department of Politics, Princeton University

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This document outlines the undergraduate courses in quantitative analysis, political economy, and strategy in politics. These courses provide undergraduate students with analytical tools they can use to conduct rigorous social science research for junior and senior independent research.

## 1 Quantitative Analysis

In today's information world, a vast amount of data are available in many fields and the role of statistics is rapidly increasing in academia, business, journalism, law, medicine, public policy, and many other parts of the society. Several years ago, the *New York Times* published an article entitled "For Today's Graduate, Just One Word: Statistics."

The department offers a two course sequence on quantitative analysis (POL 345 and 346). These courses will provide students with basic statistical methods that are useful for junior and senior independent research as well as summer internships and post-graduate career. These courses are also part of the **Statistics and Machine Learning certificate** (see <http://sml.princeton.edu> for a full description of the pathway to satisfy the certificate requirements). In addition, the department offers a course on data visualization (POL 245).

Finally, every year, a couple of motivated undergraduate students who completed the undergraduate sequence take part in a graduate sequence on quantitative analysis (POL 571, 572, and 573). Many of them have done well in these graduate courses and gone to top Ph.D. programs in social sciences after graduation. If you are interested in pursuing this path, you should consult the quantitative analysis faculty members.

- **POL 345: Introduction to Quantitative Social Science.** This course is the first in the Department's two-course sequence in undergraduate-level political methodology. It provides an introduction to statistical analyses in the social sciences. No prior knowledge aside from high school algebra is assumed. Topics include causal inference, estimation, and statistical programming. Through analyzing real world data sets, the course equips students with the skills necessary to produce a basic statistical analysis at the level of a Junior Paper or Senior Thesis. The sequence continues with POL 346. The course is typically offered in the fall semester.
- **POL 346: Applied Quantitative Analysis.** This course focuses on developing an intuition for statistics and applying it through data analysis, regression models and a final project. We will wrestle with what makes a good research question, play with data to see how statistical methods can help us make sense of real world concerns, and work at communicating quantitative findings clearly to broad audiences. Particular attention will be paid

to applying these techniques in Junior Papers and Senior Theses. Coursework involves using the R statistical platform. Upon completion of POL 345 and POL 346, students are eligible to take the Department's graduate sequence in quantitative methods. The course is typically offered in the spring semester.

- **POL 245: Visualizing Data.** In this course, we consider ways to illustrate compelling stories hidden in a blizzard of data. Equal parts art, programming, and statistical reasoning, data visualization is a critical tool for anyone who seeks to analyze data. In recent years, data analysis skills have become essential for those pursuing careers in policy advocacy and evaluation, business consulting and management, or academic research in the fields of education, health, medicine, and social sciences. This course introduces students to the powerful R programming language and the basics of creating data-analysis graphics in R. From there, we use real datasets to explore topics ranging from network data to geographical data. The course is typically offered during the summer as part of the Freshman Scholar Institute but will be offered during a regular semester in the near future.

## 2 Political Economy

Political economy is a cross-disciplinary field for students who wish to further their understandings of social phenomena and individual behavior by combining and comparing the perspectives of its two constituent disciplines. The politics department offers the **Political Economy certificate** (see <http://www.princeton.edu/politics/undergraduate/majoring-in-politics/Political%20Economy%20Certificate/> for a full description of the pathway to satisfy the certificate requirements). There are two politics department courses, open to everyone satisfying the prerequisites of ECO 100, ECO 101, and MAT 103, that are native to this sequence, POL 349, and POL 352. Normally only one of them is offered in a given year. The courses have some overlap, though they cover fairly different topics, and one can take both for credit.

- **POL 349 Political Economy.** The course studies the interaction of political and economic factors in various key policy areas. We start with some central tools that capture elements of political economy—collective action, elections, and delegation. These tools are then applied to topics such as inequality and redistribution, political economy of macroeconomic policy, and the persistence of inefficiency. The empirical content is typically drawn from the workings of established democracies. The course is normally taught in the fall semester.
- **POL 352 Comparative Political Economy.** Similarly to POL 349, this course examines the interaction between political institutions and the economy. This course places a heavy emphasis on non-democratic politics, and on the emergence, and potential collapse, of democratic institutions. As its name suggests, the course views political economy in comparative perspective, and it incorporates both case studies and multi-country cross national comparisons. The class is normally taught in the spring semester.

## 3 Strategy in Politics

As noted by Dixit and Nalebuff in *The Art of Strategy*, strategic thinking is the art of trying to outdo a rival knowing full well that she is trying to outdo you. It is also the process of trying to cooperate when everyone is motivated to help themselves, it is the art of convincing others that you mean what you say and the skill of interpreting the statements of others. All of these

activities are central to politics and the courses in political strategy, also sometimes called formal political theory, study the basic principles of strategy as they apply to various political events such as elections, legislation, and war. Unifying these broad classes of strategic environments is the theory of games, an analytical approach to thinking about problems of strategy that distills numerous contexts down to their essence: Who are the actors? What can they do? And what are the incentives?

The department offers a two course sequence in strategy in politics, teaching the basic analytical framework for thinking strategically in political settings. Using mathematical models of decision-making akin to those found in economics, finance, and evolutionary biology, students learn how to interpret political outcomes and actions in terms of political agents who, in conflict and cooperation, produce the political outcomes we see in the world.

- **POL 250 Introduction to Game Theory** This course is an introduction strategic issues in politics. Building on the basic insights of classical cost-benefit analysis this class analyzes how the environment, institutions, and individual incentives influence the political process. The class surveys a wide range of issues ranging from voting, to collective action, deliberation, and nuclear deterrence. Technical topics include strategic form and extensive form representations of a game, the use of mixed strategies, dynamic games, games with imperfect information, signaling games, moral hazard, and Bayes-Nash equilibria.
- **POL 347 Mathematical Models in Political Science.** This course offers an advanced introduction to the use of game theory to study strategy and public choice in politics. The course covers the fundamentals of static and dynamic games of complete and incomplete information, as well as an introduction to the theory of repeated games. Each topic is developed with an application in political science, including strategic voting in elections and committees, bargaining, lobbying, strategic information transmission, and political agency. Prerequisites: MAT 103.