

## University of Rochester Political Science

PSC 407  
Mathematical Modeling

Prof. Mark Fey  
Fall 2014

### Syllabus

This course is part of a rigorous introduction to the main concepts and results in positive political theory. It is the first half of a two course sequence consisting of PSC 407 and PSC 408. The sequence concentrates on the theoretical models used in contemporary political science, and provides the mathematical background necessary to fully understand them.

The sequence of PSC 407 and PSC 408 is designed to be both a rigorous foundation for students planning on taking further courses in the positive political theory field and a self-contained overview of the field for students who do not intend to do additional coursework in the field. This course will focus on developing a range of mathematical tools and applying these tools to social choice theory, which concerns finding an axiomatic basis for collective decision making. It will emphasize rigorous logical and deductive reasoning—a skill which will prove valuable, even to the student primarily interested in empirical analysis rather than modelling.

Students should have, at a minimum, a sound familiarity with basic algebra (solving equations, graphing functions, etc.) and a knowledge of basic calculus. Consistent with department policy, students are required to attend the “math camp” offered in the weeks before the fall semester.

**Course Meetings:** Lectures for the course will be Mondays and Wednesdays at 10:00 in Harkness 329.

**Course Work:** To learn mathematical material, there is no substitute for solving problems. Therefore, problem sets will be assigned most weeks. There will also be a two midterm exams and final exam. A schedule of course work is below.

Grades for the course will be assigned based on the performance on the exams and problem sets. Specifically, final grades will be determined as follows: 30% problem sets, 20% midterm #1, 20% midterm #2, and 30% final exam.

**Course Readings:** The main reference for the course is a working draft of *Analytical Methods for the Study of Politics*, by John Duggan and myself. The draft will be made available online.

In addition, there are two textbooks that will be useful for the course:

- Simon and Blume, *Mathematics for Economists*
- Ordeshook, *Game Theory and Political Theory*

There are also two recommended texts:

- Binmore, *Mathematical Analysis*
- Cupillari, *The Nuts and Bolts of Proofs*

**Schedule:** Below is the schedule of course work for the course. Naturally, this schedule may change as the semester unfolds.

Sept. 1 No class. Labor Day.

Sept. 17 Problem set 1 due.

Sept. 24 Problem set 2 due.

Oct. 1 Problem set 3 due.

Week of Oct. 6 & 8 **Midterm #1**

Oct. 13 No class. Columbus Day.

Oct. 22 Problem set 4 due.

Oct. 29 Problem set 5 due.

Nov. 5 Problem set 6 due.

Week of Nov. 10 & 12 **Midterm #2**

Nov. 19 Problem set 7 due.

Nov. 26 No class. Thanksgiving.

Dec. 3 Problem set 8 due.

Dec. 10 Problem set 9 due.

Exam period **Final Exam**