

PS 135: Game Theory in the Social Sciences

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Course Description and Objectives.

Political science deals with the behavior of individuals in settings of collective or group choice. The best course of action for any individual to take in such settings generally depends on the course of action taken by others with whom they interact. For instance, the best strategy by a candidate in an election campaign might depend on the strategy adopted by other candidates. The best approach for achieving gains in a peace settlement for one nation-state depends on how other nation-states will react. *Game theory* is the analysis of decision making in situations where one individual's best action depends on the actions taken by other individuals. This course provides a relatively non-technical introduction to game theory and its application in social science, especially political science and also economics.

THE PURPOSES OF THE COURSE are to give students a sense of the field of game theory and how political scientists use it in making arguments about how government and politics work, to develop students' intuition about strategic situations in everyday life, and to develop students' analytical capabilities generally.

UPON COMPLETION OF THE COURSE, students will be able to depict social situations as simple game theoretic models, analyze those models to understand how the behaviors of the individuals involved are mutually reinforcing, and apply computer-based tools to evaluate decisions under conditions of uncertainty.

REQUIRED BACKGROUND: The course requires (and helps develop) the ability to think abstractly and to read formal expressions. These abilities are often correlated with mathematical ability. That said, the actual level of mathematics required in the course is relatively light.

Learning Activities and Materials.

The course is divided into "modules," each covering a specific topic in game theory. Each module will help you understand a different part of the field of game theory and help you learn different skills in analyzing strategic situations.

You are expected to participate fully in all the course activities described here.

VERY IMPORTANT: you won't be able to access your course material until you read and make your pledge to Academic Integrity. Click the button below to navigate to and complete the Academic Integrity pledge, found in the Academic Integrity module.

[[link to module]]

READINGS: Each module includes assigned readings from the required text relevant to each topic covered in that module.

The required text is *Games, Strategies, and Decision Making* by Joseph E. Harrington (Worth Publishers, 2nd Edition, 2014). Readings from this text for each module are listed later in this syllabus.

In addition, I will occasionally distribute other readings (as PDF files) or videos.

MULTIMEDIA LECTURES: Each module includes multiple video lectures/presentations by the professor, as well as slides which you can view as a PDF document. You will also be able to download MP3 files of the video lectures. You may complete either the readings first and then view the lectures, or vice versa, as best suits your learning style. Take notes as needed while you view or listen to the lectures, and write down any questions that these presentations raise. You can use the Questions & Answers Forum in the course web site to post questions and discuss with your classmates.

QUIZZES: Some modules include a quiz that must be completed and submitted within 48 hours of completing the module. Refer to the schedule below for all due dates. You may take each quiz only once and there is a limited period of time in which to complete each quiz. Late submission will result in a $\frac{1}{3}$ reduction of the score, for each day the quiz is late (up to 3).

Quizzes will consist of multiple choice problems, short-answer problems, and essays.

QUESTION AND ANSWER FORUM: Use this forum to post questions about the course material, assignments, readings, the course website, or the course itself. You are encouraged to post constructive responses to questions from other students as well. The professor and GSIs will monitor this forum as well. This forum will serve as a general FAQ about the course and its content.

FINAL EXAM: This course includes an in-person final exam to last 3 hours. The exam format will be similar to that of the quizzes. It is comprehensive over all course material. You must pass the final exam with a score of at least 60% to pass the course. The final exam will take place on the Berkeley campus; DATE AND ROOM TBA.

If you cannot be on campus for the final exam, you must make arrangements to take a proctored exam off campus. Review the Proctor Information on the navigation menu of the online course management system. Proctored applications should be submitted at least four weeks before the final exam, and earlier is better.

Grades.

The course grade will be determined as follows:

- Quizzes (6): 60%
- Final Exam: 35%
- Participation: 5%

All assignments/exams will be scored on a 100 point scale. You must receive a score of at least 60% on the final exam in order to pass the course. No quizzes or assignments will be dropped from the final grade.

An A is 90% or above, B is 80% or above, C is 70% or above, D is 60% or above, and F is below 60%. A “+” or “-” designation is made for scores in the top and bottom 2% of each range, respectively. A+ is a possible grade but is reserved for students whose performance is all-around exceptional; thus the determination of A+ is not strictly numerical and it is possible to score 100% and not receive an A+. In practice about 1-2% of the class typically receives an A+.

Class participation grades will be assigned by collaboration between the professor and the GSI.

Academic dishonesty of any kind, will not be tolerated. I have turned in a number of students for cheating on problem sets in the past.

Sequence of Topics

PART I: ONE-SHOT INTERACTION AND STRATEGIC FORM GAMES

Readings. Chapter 1, chapter 2, chapter 3 (including appendix 3.6 and 3.8), chapter 4 (excluding section 4.6, but including appendix 4.7), chapter 5, chapter 6 (except 6.3), chapter 7 (including appendix 7.7).

Session1 Introduction. Course themes. The role of models. The rational choice postulate.

Session2 Static interactions and strategic games; dominance

Session3 Nash equilibrium: definition and properties; examples

Session4 Applications: collective action problems, auctions, electoral competition, median voter theorem

Session5 Expected payoffs: computer simulation and sensitivity analysis

PART II: DYNAMIC INTERACTION AND EXTENSIVE FORM GAMES

Readings. chapter 8, chapter 9 (excluding section 9.5).

Session6 Dynamic interactions and extensive form games; backward induction

Session7 Subgame perfect Nash equilibrium: definition and properties; examples

Session8 Applications: bargaining, international conflict, delegation and oversight

Session9 Backward induction and expected payoffs: computer simulation and sensitivity analysis

Session10 Review/Catch up

Session11 **Midterm Exam**

PART III: INFINITELY REPEATED GAMES

Readings. Chapter 13 (including appendix 13.6), chapter 14.

Session12 Strategies and payoffs

Session13 NE and SPNE in infinitely repeated games; folk theorems

Session14 Applications: infinitely repeated prisoners dilemma; infinite horizon bargaining

PART IV: GAMES WITH ASYMMETRIC INFORMATION

Readings. Chapter 10 (including appendix 10.6), chapter 11 (including appendix 11.5 and 11.6), chapter 12.

Session15 Types and strategies in games of incomplete information; Bayes Nash equilibrium

Session16 Applications: pivotal voting; auctions

Session17 Dynamic games of incomplete information; perfect Bayesian equilibrium

Session18 Applications: incomplete information bargaining

Session19 Application: signaling games; pooling and separating equilibria

Session20 Application: advice and information transmission; cheap talk games

Session21 Application: principal-agent models; moral hazard and adverse selection

Session22 Catch-up and summary.

Session23 **Final exam**