Any time more than one person make decisions that affect their own and the others’ outcomes can be modeled by game theory. The decisions can be made simultaneously or sequentially and with or without knowledge of explicitly how one’s decisions affect the others. The decisions and outcomes may be symmetric or asymmetric. The relationships can be competitive or cooperative. There may be one or repeated interactions between decision makers. Game theory is the collection of mathematical tools to model and analyze the above behaviors. This course will introduce the basic concepts and tools of game theory and will demonstrate how formal models are used in the social sciences. At the end of this course, you should be in a position to read and evaluate game theoretic models in the political science literature.

The course begins by introducing ideas from utility and decision theory, thereby forming the foundation of game theory. From this foundation, classical game theoretic ideas are constructed; these ideas are motivated by applications and reinforced with examples and problem sets. This pattern persists through the many types of behavior that game theory can model. Diverse applications motivate an area of game theory. The mechanics are introduced and solution concepts determined. For future reference, examples become canonical representatives of the area. We will cover many of the recent developments in non-cooperative game theory.

The course will consist of a combination of lectures, discussions, and problem-solving sessions. Besides the in-class problems, homework problems will be regularly assigned. An understanding of previous material will often be necessary for new material. Hence, assignments will have to be completed in a timely fashion. The problem sets will account for 50% of the final grade. The rest of your grade will come from a midterm (20%) and take home final exam (30%).

Although the course content concentrates on the concepts, intuition, and structure of game-theoretic models, some mathematics is required to analyze the models. Students in this class should be comfortable with elementary linear algebra and elementary probability theory. Knowledge of elementary differential calculus is helpful, but not essential.

There is one required textbook for this course:

Additional supplementary readings will be distributed in class, put on reserve, and/or posted on New York University’s Blackboard course management system. Homework problems will be assigned from this text. Additional perspectives are often useful in learning a subject area. An incomplete list of supplementary texts follows the outline of the course.

Michael A. Jones, Associate Professor, Department of Mathematical Sciences, Montclair State University, Upper Montclair, NJ 07043; jonesm@mail.montclair.edu; 973-655-5448 (office); 973-460-5773 (cell). I will give you my NYU information as it becomes available.
Course Outline.

Utility and Decision Theory
The properties of ordinal and cardinal preferences. Lotteries and expected utility. Risk aversion and risk seeking. Decision theory. Optimization as a transition to equilibrium.

An Introduction to Normal Form Games

Applying Normal Form Games

Mixed Strategy Equilibria for Normal Form Games

Extensive Form Games with Perfect Information

Applying Extensive Form Games with Perfect Information

More Applications of Extensive Form Games

Nash Equilibria.
Nash equilibria in normal form games. Mixed strategy Nash equilibria. The existence of Nash equilibria. (Readings: Morrow Chpt. 4)

Cooperative Games.

Bayesian Games.

Extensive Form Games with Incomplete Information
Repeated Games
Finitely repeated games: Prisoners’ Dilemma. Infinitely Repeated Games: Prisoners’ Dilemma.
Subgame perfection. One-stage deviation principle. Folk theorem.

Bargaining theory.
As an extensive game. Trade in a market. Pork barrel model of legislatures. Two-level games as models of international negotiations. Nash’s axiomatic model.

Alternative Solution Concepts.

An Incomplete List of Supplementary Texts


