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Department of Economics, Brandeis University
Econ 181: Game Theory and Its Applications, Fall 2012

COURSE OUTLINE

Overview: Game Theory is a formal structure for analyzing strategic situations ("games"), defined as any situation in which individuals or organizations pursue one or more objectives, and their success in achieving their objectives depends on both their own actions and the actions of other "players" of the game. The theory provides results regarding how players should act in order to maximize their ability to achieve their objectives ("normative" theory), as well as predictions as to the outcomes of games if all players optimally pursue their own interests ("predictive" theory). We will explore both normative and predictive game theory, and also discuss experimental and empirical evidence as to the validity of the theory's predictions. We will look at applications of the theory in personal experiences, business and public policy. The course is intended for upper-level undergraduates as well as IBS Masters' students.

Course objectives: Students should be able to take any strategic situation and analyze it using the concepts of game theory, to make recommendations as to how the players should act, and predictions of likely outcomes. You should also be able to comment on the caveats that should be applied in using the theory in any given situation, based both on the formal limitations of the theory and the experimental and empirical evidence regarding its validity.

Prerequisites and mathematical preparation: Students should have completed Econ 81a (Intermediate microeconomic theory) and Econ 83a (Introduction to probability and statistics) or their equivalents. Students will need to be able to apply mathematical reasoning and methods, particularly:

- Solving n linear equations with n unknowns;
- Solving simple maximization problems, by taking the derivative of simple algebraic functions, setting the derivative to zero and solving the resulting equation for the decision variable;
- Applying Bayes' Rule to evaluate conditional probabilities;
- Calculating the expected value of a set of outcomes with corresponding probabilities;
- Using graphical representations of equilibria as the intersection of two curves, and analyzing how the equilibrium changes when the curves shift.

If you have any questions about your preparation for the course, please email me at the above address and we will discuss your situation.

Course requirements: The course will be taught in a mixed lecture/discussion format, with problem sets and game simulation exercises designed to let you learn the key concepts actively.

- class attendance and class participation (25%)
- problem sets and simulation exercises (group work encouraged) (20%)
- Registrar-scheduled 3-hour final exam (30%)
- 5-7 page Headline Analysis Paper (10%)

Disabilities: If you are a student with a documented disability on record at Brandeis University and wish to have a reasonable accommodation made for you in this class, please see me.

Academic Integrity*:* You are expected to be familiar with and to follow the University's policies on academic integrity (see ***http://www.brandeis.edu/studentlife/sdc/ai***). I will refer any suspected instances of alleged dishonesty to the Office of Student Development and Conduct. Instances of academic dishonesty may result in sanctions including but not limited to, failing grades being issued, educational programs, and other consequences.

Topic Outline:

1. Introduction and historical overview
2. Building formal models of strategic
3. Solving a game—introduction to Nash Equilibrium
4. Randomized strategies
5. Sequential games and backward induction
6. Games of imperfect information
7. Signaling
8. Cheap talk
9. Infinitely repeated games

Examples of applications to be discussed:

1. Haggling over the price of a car
2. Calling pitches in baseball
3. Racial segregation
4. Auctions
5. Price and quality competition among firms
6. Introduction of new products, and strategic deterrence of competitive entry
7. Competition between systems—Windows versus Mac or the Browser wars
8. Investing in education as a way to "signal" your quality to prospective employers
9. Adverse selection—why competitive markets for health insurance are problematic
10. Reputation and cooperation