



Course: **Game Theory**

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Term: Fall

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Office Hours: By appointment

General Description

The course covers the basic and standard concepts of non-cooperative and cooperative Game Theory at a graduate level.

Course Outline

1.- Introduction to Game Theory and Some Examples

- 1.1.- Aim of Game Theory
- 1.2.- Decision Theory (one agent)
- 1.3.- Decision Theory (two players): Game Theory
- 1.4.- History of Game Theory
- 1.5.- Non-cooperative *versus* Cooperative Games
- 1.6.- Examples

2.- Games in Normal Form

- 2.1.- Definition and Examples
- 2.2.- Nash Equilibrium
- 2.3.- Interpretation of Nash Equilibrium
- 2.4.- The Mixed Extension
- 2.5.- Computing Nash Equilibria
- 2.6.- General Existence Theorem
- 2.7.- Two-person Zero-sum Games: The Minimax Theorem
- 2.8.- Fictitious Play

3.- Games in Extensive Form

- 3.1.- Preliminaries
- 3.2.- Perfect Information
- 3.3.- Nash Equilibrium: Backwards Induction and Kuhn's Theorem
- 3.4.- Imperfect Information

4.- Nash Equilibrium and Related Issues

- 4.1.- Introduction
- 4.2.- Dominant Strategies
- 4.3.- Elimination of Dominated Strategies
- 4.4.- Subgame Perfect Equilibrium
- 4.5.- Trembling-hand Perfect Equilibrium
- 4.6.- Perfect Equilibrium in the Normal Form
- 4.7.- Perfect Equilibrium and Undominated Strategies
- 4.8.- Proper Equilibrium
- 4.9.- Rationalizable strategies
- 4.10.- Correlated Equilibrium

5.- Repeated Games

- 5.1.- Introduction
- 5.2.- Strategies
- 5.3.- Payoffs
- 5.4.- Folk Theorems
- 5.5.- Stochastic Games

6.- Games of Incomplete Information

- 6.1.- The Harsanyi Solution
- 6.2.- Bayesian-Nash Equilibrium
- 6.3.- Sequential Equilibrium
- 6.4.- Using Bayesian-Nash Equilibria to Justify Mixed Equilibria
- 6.5.- Signaling Games and Forward Induction

7.- Bargaining Theory

- 7.1.- Bargaining Theory
- 7.2.- The Bargaining Problem
- 7.3.- The Nash Bargaining Solution
- 7.4.- The Kalai-Smorodinsky Solution
- 7.5.- Strategic Bargaining

8.- Cooperative Games

- 8.1.- Preliminaries
- 8.2.- Core
- 8.3.- Stable Sets
- 8.4.- Bargaining Sets
- 8.5.- Shapley Value
- 8.6.- Nucleolus

Text Books

- Binmore, K. *A Primer in Game Theory*. D. C. Health & Company, 1992.
- Van Damme, E. *Stability and Perfection of Nash Equilibria*, Springer-Verlag, 1991.
- Driessen, T. *Cooperative Games, Solutions and Applications*. Kluwer Academic Publishers, 1988. Friedman, J. *Game Theory with Applications to Economics* (second edition). Oxford University Press, 1991.
- Fudenberg, D. and J. Tirole. *Game Theory*. MIT Press, 1991. Gibbons, R. A *Primer in Game Theory*. Harvester Wheatsheal, 1992.
- Harsanyi, J. and R. Selten. *A General Theory of Equilibrium Selection in Games*. MIT Press, 1988
- Kreps, D. *Game Theory and Economic Modeling*. Clarendon Press, 1990. Luce, R., and H. Raiffa. *Games and Decisions*. Wiley, 1957
- Mas-Colell, A., M. Whinston, and J. Green. *Microeconomic Theory*. Oxford University Press, 1995. Moulin, H. *Game Theory for the Social Sciences* (second edition). New York University Press, 1986.
- Moulin, H. *Axioms of Cooperative Decision Making*. Cambridge University Press (Econometric Society Monographs), 1988.
- Myerson, R. *Game Theory: Analysis of Conflict*. Harvard University Press, 1991.
- Von Neumann, J. and O. Morgenstern. *The Theory of Games and Economic Behavior*. Princeton University Press, 1944.
- Osborne, M.J. *An Introduction to Game Theory*. Oxford University Press, 2004.
- Osborne, M.J. and A. Rubinstein. *A Course in Game Theory*. MIT Press, 1994.
- Owen, G. *Game Theory* (second edition). Academic Press, 1982.
- Schelling, T. *The Strategy of Conflict*. Harvard University Press, 1960. Shubik, M. *Game Theory in the Social Sciences*. MIT Press, 1984.
- Vega-Redondo, F. *Economics and the Theory of Games*. Cambridge University Press, 2003.
- Michael Maschler, Eilon Solan, and Shmuel Zamir. *Game Theory*. Cambridge University Press (2013).
- Hans Peters. *Game Theory: A Multi-level Approach*. Springer (2008).

Grading: The 85% of the final grade is based on the grade of the Final Exam, and the 15% remaining on the grades obtained in the weekly problem sets. Each week the TA will grade and solve the most representative problems in the list and will attend in her office hours all doubts and questions that may arise during the preparation of their answers. It is important that at the end of the course the student understands and knows the answers of all questions asked in all problems sets.