

Introduction to Game Theory

SOCSC-UH 2210
NYUAD, FALL 2018

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Office hours: Mondays 3pm-4.30pm and by appointment.

General Description: This course introduces the basic concepts of game theory and their application in social sciences. The course focuses on topics and the main concepts of non-cooperative game theory: Nash equilibrium in static games, subgame perfection in dynamic games of complete information, repeated games, Bayesian Nash equilibrium in static games with incomplete information, and sequential equilibrium in dynamic games with incomplete information. The course relies on a wide array of applications in the social sciences including the strategic choice of electoral platforms, political party formation, lobbying, oligopoly, auctions, labor market signaling, collusion and coordination among others.

Time and location: 1:15 PM - 2:30 PM Mon-Wed, Room C2-E050.

Prerequisites: Mathematics for Social Sciences I or Calculus with Applications.

Participation and attendance policies: Attendance is mandatory and class participation will count in the final grade (see below the final grade components). Students are expected to have completed all the required readings for each week before the class meeting. Absences are permitted only in cases of illness, family or personal emergencies. Students are expected to provide proof that an absence occurred for one of these reasons.

Note: I have included also some “optional” reading in some weeks, these readings are only for students who want to know more about each topic, you will not be expected to have read these before class.

Learning Outcomes: The main objective of the course is to teach students the basic concepts, methods and terminology of game theory and strategic thinking. The second aim is to allow students to apply these analytical tools to many different settings, from political science, economics, to other social scientific situations.

Main textbook:

- Gibbons, Robert. 1992. *Game Theory for Applied Economists*. Princeton University Press.

This book will be available for purchase at the NYUAD book store and on reserved in the library.
For additional exercises and complementary material we will use:

- Watson, Joel. 2007. *Strategy: An Introduction to Game Theory (2nd Ed)*. W. W. Norton & Company.

For people not familiar with economic theory and with little exposure to social sciences the following is good introduction for many of topics of the class (recommended only):

- A. Dixit and B. Nalebuff. *Thinking Strategically*. Norton 1991

In addition, I will assign other selected readings, papers and class notes during some weeks. All readings, papers, and class materials will be posted on the NYUClasses server (<https://newclasses.nyu.edu/portal>).

Components of the final grade: the final grade is based on problem sets, one midterm, a final exam and class participation. The weight of each component is the following:

- Problem Sets 35%
- Midterm exam 25%
- Final exam 35%

- Class participation 5%

Rules of problem sets: Each week a new problem set will be introduced on Monday and it is to be returned on the subsequent Monday in hard copy at the beginning of class (please do not send these by e-mail). The due date is strict. Although problem sets can be solved in small groups (no more than three people), students are encouraged to work individually before the group meeting. Answers will be posted the day the problem set is due, hence late problem set solutions will not be accepted. Problem sets solutions can be handwritten by please be organized and clear in your solutions.

Rules of the class:

- i) Laptops and cell phones are not allowed (i.e., texting and internet browsing are not allowed during class).
- ii) Please be on time for class.
- iii) Students absent due to an illness or a family emergency should provide proof of such situation (e.g., medical note).

Class Outline

Lecture 1 (Sep 3). Introduction and motivation (no readings)

Lecture 2 & Lecture 3 (Sep 5 & 8). Strategies, Normal Form (strategic) representation, Rationalizability and Iterated Elimination of Strictly Dominated Strategies-

1. Gibbons, R.. *Game Theory for Applied Economists*. Chapter 1, Sections 1.1.A & 1.1.B.
2. Watson, J. Strategy. *Strategy*. Chapters 3, 5, 6 & 7
3. Class notes

Optional:

- Pearce. 1984. Rationalizable Strategic Behavior and the Problem of Perfection," *Econometrica* 52:1029-1050.

Lecture 4 (Sep 10). Nash Equilibrium I. Motivation, definition, and applications

1. Gibbons, Robert. *Game Theory for Applied Economists*. Section 1.1.C.
2. Watson, J. Strategy. *Strategy*. Chapter 9.

**** September 12 (Wednesday): No classes: Al-Hijra/ Islamic New Year ****

**** September 15 (Saturday): Add/ drop deadline for 14-week courses ****

Lecture 5 (Sep 17). Nash equilibrium II. Mixed strategies and existence

1. Gibbons. *Game Theory for Applied Economists*. Chap 1 (Section 1.3)
2. Watson. Strategy. Chapter 4 & 11.

Optional

- Nash, John. "Equilibrium Points in n-Person Games." *Proceedings of the National Academy of Sciences*, Vol 36: 48-49

**** First problem set due ****

Lecture 6 & Lecture 7 (Sep 19 & Sep 24). Dynamic Games with Complete Information I. Extensive-form representation, backward induction.

1. Gibbons, Robert. *Game Theory for Applied Economists*. Chap 2 (Sections 2.1.A/B/C).
2. Watson. *Strategy*. Chap 14 & 15.

Optional

- Mas-Colell, Andreu, M. Whinston, and J. Green. 1995. *Microeconomic Theory*. Oxford. Ch 7 (Section 7.C) and Ch 9 (Sections 9.A and 9.B)

**** Second problem set due ***

Lecture 8 (Sep 26). Dynamic Games with Complete Information II. Subgame perfection

1. Gibbons, Robert. *Game Theory for Applied Economists*. Chap 2 (Sec 2.2 and 2.4)
2. Watson. *Strategy*. Chap 15.

Optional

- Mas-Colell, Andreu, M. Whinston, and J. Green. 1995. *Microeconomic Theory*. Oxford. Ch 9 (Appendix A & B)

**** Third problem set due ***

Lecture 9 (Oct 1). Midterm Review (NE in statics games and dynamic games with complete information)

**** **Exam 1 (Oct 3).** Midterm Exam ****

Lecture 10 & Lecture 11 (Oct 8 & 10). Repeated games I. Introduction, ultimatum games and sequential bargaining

1. Gibbons, Robert. *Game Theory for Applied Economists*. Section 2.1 (D)
2. Watson. *Strategy*. Chapter 19.

Optional:

- Mailath, George, and Larry Samuelson. 2006. *Repeated Games and Reputations*. Oxford. Chapter 1 (Introduction)

Lecture 12 (Oct 15 & 17). Repeated games II. Two-stage repeated games and infinitely repeated games

1. Gibbons, Robert. *Game Theory for Applied Economists*. Section 2.3
2. Watson. *Strategy*. Chapter 22

**** Fourth problem set due ***

**** October 22-26 (Mon-Fri), Fall break ****

Lecture 13 (Oct 27-Sat Legislative Day). Static games of incomplete information I. Introduction to Bayesian games

1. Gibbons, R. *Game Theory for Applied Economists*. Chap 3 (Section 3.1.A/C)
2. Watson, J. *Strategy*. Chapter 24, 26 and 28.

Lecture 14 (Oct 29). Static games of incomplete information II. Applications

1. Gibbons, R. *Game Theory for Applied Economists*. Chap 3 (Section 3.2)
2. Watson, J. *Strategy*. Chapter 27 and 29.

**** Fifth problem set due ***

Lecture 15 & Lecture 16 (Oct 31 & Nov 5). Dynamic games of incomplete information. Perfect Bayesian Equilibrium, sequential bargaining, and cheap-talk.

1. Gibbons, Robert. *Game Theory for Applied Economists*. Chap 4 (Sections 4.1 and 4.3.A/B)

**** Sixth Problem set due ***

Lecture 17 (Nov 7). Reputation

1. Gibbons, Robert. *Game Theory for Applied Economists*. Chap 4 (Section 4.3.C)
2. Mailath, George, and Larry Samuelson. 2006. *Repeated Games and Reputations*. Oxford. Chapter 15 (Sections 15.1 and 15.3)

**** November 9 (Friday), Withdrawal and change of grading basis deadline for 14-week courses ****

Lecture 18 & Lecture 19 (Nov 12 & 14). Asymmetric Information Games I. Signaling games and the Intuitive Criterion

1. Gibbons, Robert. *Game Theory for Applied Economists*. Chap 4 (Section 4.2 & 4.4)

Optional

Michael Spence. 1973. "Job Market Signaling". *Quarterly Journal of Economics*, 87,3: 355–374

**** Seventh Problem set due ***

Lecture 20 & Lecture 21 (Nov 19 & 26). Asymmetric Information Games II. Principal-agent problem and applications.

1. Kreps, David. 1990. *A Course in Microeconomic Theory*, Chap 17.
2. Class notes

Optional

- Akerlof, George A. 1970. "The Market for 'Lemons': Quality Uncertainty and the Market Mechanism". *Quarterly Journal of Economics*. 84 (3): 488–500

**** November 21 (Wednesday), No classes: Prophet's Birthday holiday ****

**** Problem set due ****

***** Special Topics *****

Lecture 22 & Lecture 23 (Nov 28 & Dic 3). Evolutionary Stability. Evolutionary foundations of equilibrium and evolutionary stable strategies

1. Osborne, Martin. 2004. *Introduction to Game Theory*. Oxford. Chapter 13

**** December 2 (Sunday), No classes: UAE National Day holiday ****
**** Last Problem set due ***

Lecture 24 & Lecture 25 (Dic 5 & 10). Coalition games and the core

1. Osborne, Martin. 2004. *Introduction to Game Theory*. Oxford. Chapter 8

Lecture 26 (Dic 12). Final Review

**** **Exam 2.** Final Exam, December 17-22 (Date TBD) ****