

**ECON 9190: Applied Game Theory**  
**Fall 2015**

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**Location:** Arts and Humanities 320

**Time and Date:** M, 4:30 -7:00 pm

**Office Hours:** Wednesdays, 1:00pm - 2:30pm and by appointment

**The course syllabus provides a general plan for the course; deviations may be necessary.**

**Statement on Academic Honesty:** Students are expected to abide by GSU's policy on academic honesty, which is published in the student handbook. A portion of this policy follows:

"As members of the academic community, students are expected to recognize and uphold standards of intellectual and academic integrity. The University assumes as a basic and minimum standard of conduct in academic matters that students be honest and that they submit for credit only products of their own efforts. The student is responsible for understanding the legitimate use of resources; the appropriate ways of acknowledging academic, scholarly, or creative indebtedness; and the consequences of violating this responsibility"

**Statement on accommodation for a disability.** "Students who wish to request accommodation for a disability may do so by registering with the Office of Disability Services. Students may only be accommodated upon issuance by the Office of Disability Services of a signed Accommodation Plan and are responsible for providing a copy of that plan to instructors of all classes in which an accommodation is sought." [Office of Disability Services is located in the Student Center]

**Statement on course assessment.** "Your constructive assessment of this course plays an indispensable role in shaping education at Georgia State. Upon completing the course, please take time to fill out the online course evaluation."

**Course Description and Objectives:** Game theory, also known as multi-person decision theory, analyzes situations in which payoffs to players depend on the behavior of other players as well as the player himself/herself. Game theory has found many applications in various fields, such as economics, biology, law, politics, sociology, and computer science. The purpose of this course is to introduce the basic tools of game theoretical analysis to our graduate students, mainly Ph.D. students.

Game-theoretic fundamentals include basic decision theory and measurement of payoffs, games in normal (strategic) and extensive forms, Nash equilibrium and its refinements, existence results, perfect and imperfect information, mixed strategies, introduction to repeated

games, games with incomplete information. In the process, we will introduce many applications of game theory in economics.

**Prerequisites:** Students should be comfortable with mathematical notation and formal reasoning. Some background in microeconomics (Econ 9010 and 9030), mathematical techniques (Econ 8030), and basic probability theory (Econ 8740) are required. Students without this background are urged to contact the instructor before deciding to enroll in the course.

**Grading Policy:** There will be a set of HW assignments, two exams and one paper presentation. The final grade for the course will be based on exams (25% each), presentations (25%) and HW assignments (25%). I'll drop two lowest HW assignment scores. If you decide to write a term paper then you do not need to take Exam 2.

**Letter Grades:** A+ (98-100), A (94-97), A- (90-93), B+ (87-89), B (83-86), B- (80-82), C+ (77-79), C (73-76), C- (70-72), D (60-69), F (0-60).

**Textbooks:**

- Osborne, M. and A. Rubinstein, 1994. *A Course in Game Theory*, The MIT Press.
- Aliprantis, C.D. and S.K. Chakrabarti, 2011. *Games and Decision Making*, 2nd ed., Oxford University Press.

**Other Books and General Readings:** As the course progresses, I will distribute reading material. You may find the following books useful as supplementary materials:

- Camerer, C.F., 2003. *Behavioral Game Theory: Experiments in Strategic Interaction*, Princeton University Press.
- Fudenberg, D. and J. Tirole, 1991. *Game Theory*, The MIT Press.
- Eric Rasmusen, 2007. *Games and Information: An Introduction to Game Theory*, 4th ed., Blackwell Publishing Princeton University Press.
- Shoham, Y. and Leyton-Brown, K., 2010. *Algorithmic, Game-Theoretic and Logical Foundations*

**Course Outline** (deviations may be necessary)

1. Introduction (*week 1*)
  - (a) Strategic Games
  - (b) Dominant Strategies
  - (c) Nash Equilibrium
  - (d) Maxmin strategies
  - (e) Strictly Competitive Games

(O&R, Ch.2.1-2.3; A&C, Ch.2; A&C, 9.2)

Rubinstein, A., 1991. "Comments on the interpretation of game theory," *Econometrica*, 59, 909-924.

Holt and Roth, 2004. "The Nash Equilibrium: A perspective". *Proceedings of the National Academy of Sciences*, 101,3999-4002.

Walker and Wooders, 2001. "Minimax Play at Wimbledon", *American Economic Review*, 1521-1538.

2. Nash Equilibrium (*week 2*)

(a) Games with Incomplete Information

(b) Extensive Form Games

(O&R 2.4-2.6; A&C 2.7, 3, 4.1-4.3)

\*Nash, J.F., 1950. Equilibrium Points in N-Person Games. *Proceedings of the National Academy of Sciences, USA*, 36: 48-9.

\*Nash, J.F, 1951. Non-Cooperative Games. *Annals of Mathematics*, 54: 286-295.

\*Harsanyi, J.C. , 1967-1968. "Games with Incomplete Information Played by 'Bayesian' players, Parts I-III, " *Management Science*, 14, 159-82, 320-34, 486-502.

3. Correlated Equilibrium (*week 4*)

(a) (O&R, 3.1-3.3)

\*Aumann (1974). Subjectivity and Correlation in Randomized Strategies. *Journal of Mathematical Economics* **1**, 67-96.

4. Rationalizability (*week 3*)

(a) Rationalizability

(b) Iterated Elimination of strictly/weakly Dominated Strategies

(c) Dominance Solvability

(Osborne and Rubinstein: Ch. 4)

\*Bernheim (1984).Rationalizable Strategic Behavior. *Econometrica* **52**, 1007-28

\*Pearce (1984). Rationalizable Strategic Behavior and the Problem of Perfection. *Econometrica* **52**, 1029-50.

5. Sequential Games (*week 3*)

(a) Main results

(b) Applications: The Monitoring Game, Optimal Contracts

(A&C, Ch.4)

6. Sequential Rationality (*week 5*)

(a) Sequential Equilibrium

- (b) Trembling Hand Perfect Equilibrium
- (c) Perfect Bayesian Equilibrium
- (d) Applications: Job Market Signaling

(O&R: Ch.12; A&C, Ch.8)

\*Spence, A.M. (1973). Job Market signaling. *Quarterly Journal of Economics* 87, 355-374.

7. Repeated Games (*week 6*)

(O&R, Ch.8; A&C, Ch.7)

\*Kreps, D., P. Milgrom, J. Roberts, and R. Wilson, 1982. "Rational Cooperation in the Finitely Repeated Prisoners' Dilemma," *Journal of Economic Theory*, 27: 245-252.

\*Bó, P.D., 2005. "Cooperation under the shadow of the future: experimental evidence from infinitely repeated games." *American Economic Review*, pp.1591-1604.

8. Exam 1 (*week 7*)

9. Auctions (*week 8*)

- (a) Private Value Auctions
- (b) Common Value Auctions
- (c) The Revenue Equivalence Theorem

(A&C, Ch.5; Fudenberg and Tirole, Ch.7)

\*Maskin, E., 2004. "The unity of auction theory: Milgrom's masterclass." *Journal of Economic Literature*, 42(4), pp.1102-1115.

10. Mechanism Design (*week 9 & 10*)

- (a) Mechanism Design with a Single Agent
- (b) Mechanism Design with Several Agents
- (c) The Groves Mechanism
- (d) Inefficiency Theorems

(Fudenberg and Tirole: ch. 7)

11. Evolutionary Equilibrium (*week 11*)

- (a) Monomorphic pure strategy equilibrium
- (b) Polymorphic equilibrium

\*Hammerstein, P. and R. Selten, 1994. "Game Theory and Evolutionary Biology" in Handbook of Game Theory, Vol.2 (Aumann and Hart, eds.), 929-993.

12. Bargaining Problem (*week 12*)

- (a) The Nash Solution

- (b) The core of a Bargaining Game
- (c) Sequential Bargaining
- (d) Applications: Allocating the Tax Burden, an automobile purchase.

(A&C, Ch.6)

\*Nash Jr, J.F., 1950. "The bargaining problem". *Econometrica* pp.155-162.

#### 13. Matching Algorithms (*week 13*)

- (a) Roth, A.E., SÃ¶nmez, T. and Ãœnver, M.U., 2005. "Pairwise kidney exchange." *Journal of Economic Theory*, 125(2), pp.151-188.
- (b) Ashlagi, I., Fischer, F., Kash, I.A. and Procaccia, A.D., 2013. "Mix and match: A strategyproof mechanism for multi-hospital kidney exchange." *Games and Economic Behavior*, 91, pp.284-296.

#### 14. Networks (*week 14*)

- (a) Jackson, M.O., Rodriguez-Barraquer, T. and Tan, X., 2012. "Social capital and social quilts: Network patterns of favor exchange". *The American Economic Review*, pp.1857-1897.
- (b) BramoullÃ©, Y. and Kranton, R., 2007. "Public goods in networks". *Journal of Economic Theory*, 135(1), pp.478-494.

#### 15. Exam 2 (*week 15*)

### Topics for presentation

#### 1. Level-k thinking

- (a) Costa-Gomes, M.A. and Crawford, V.P., 2006. "Cognition and behavior in two-person guessing games: An experimental study." *The American Economic Review*, pp.1737-1768.
- (b) Stahl, D.O. and Wilson, P.W., 1995. "On playersâ€™ models of other players: Theory and experimental evidence". *Games and Economic Behavior*, 10(1), pp.218-254.

#### 2. Repeated Games

Fudenberg, D., Rand, D.G. and Dreber, A., 2012. "Slow to Anger and Fast to Forgive: Cooperation in an Uncertain World." *American Economic Review*, 102(2), pp.720-749.

#### 3. Quantal Response Equilibrium

- (a) McKelvey, R.D. and Palfrey, T.R., 1995. "Quantal response equilibria for normal form games." *Games and Economic Behavior*, 10(1), pp.6-38.
- (b) McKelvey, R.D. and Palfrey, T.R., 1998. "Quantal response equilibria for extensive form games." *Experimental economics*, 1(1), pp.9-41.

#### 4. Regret Minimization

- (a) Halpern, J.Y. and Pass, R., 2012. Iterated regret minimization: A new solution concept. *Games and Economic Behavior*, 74(1), pp.184-207.

#### 5. Deferred Acceptance Auctions

- (a) Milgrom, P. and Segal, I., 2014, June. "Deferred-acceptance auctions and radio spectrum reallocation". In *EC* (pp. 185-186).

#### 6. Networks

- (a) Ballester, C., CalvÃ³ Armengol, A. and Zenou, Y., 2006. "Who's who in networks. wanted: the key player". *Econometrica*, 74(5), pp.1403-1417.
- (b) Morris, S., 2000. Contagion. *The Review of Economic Studies*, 67(1), pp.57-78.