

Market Design
Farshad Fatemi, Behrang Kamali

Monday & Tuesday 16:30-18
(Fall 2017)

This version: *January 7, 2017*

Description

This course studies topics in market design —auctions and two-sided matching problems— focusing on the incentives created by market rules and the efficiency of the outcome.

Graduate students in Economics, Mathematics, Computer Science, Computer Engineering and related areas are welcome. Advanced undergraduate students may take the course with permission from the instructors.

Textbooks

Optional for the course are:

Krishna, Vijay. Auction theory. Academic press, 2009.

Roth, Alvin E. and Marilda A. O. Sotomayor (1990), Two-Sided Matching: A Study in Game-Theoretic Modeling and Analysis, Cambridge University Press.

Interesting & Non-Technical Articles

- Klemperer, Paul. “Why every economist should learn some auction theory.” Available at SSRN 241350 (2000).
- Jackson, Matthew O. “Matching, auctions, and market design.” Available at SSRN 2263502 (2013).
- Kojima, Fuhito. “Recent Developments in Matching Theory and Their Applications.” (2015).

Prerequisites

Basic knowledge of Game Theory and Probability Theory are necessary.

Course Outline

Schedule and readings are listed below. You are responsible for readings with an *.

Week 1:

Overview of Market Design, Classic Market Failures in Market Design

- Roth, Alvin E. “The economist as engineer: Game theory, experimentation, and computation as tools for design economics.” *Econometrica* 70.4 (2002): 1341-1378.
- Roth, Alvin E. “What Have We Learned from Market Design?.” *The Economic Journal* 118.527 (2008): 285-310.

Week 2 & 3:

Bayesian Games

- Mas-Colell, Andreu, Michael Dennis Whinston, and Jerry R. Green. *Microeconomic theory*. Vol. 1. New York: Oxford university press, 1995.
- Osborne, Martin J., and Ariel Rubinstein. *A course in game theory*. MIT press, 1994.
- Osborne, Martin J. *An introduction to game theory*. Vol. 3, no. 3. New York: Oxford University Press, 2004.
- (*) “John C. Harsanyi - Prize Lecture: Games with Incomplete Information”. Nobelprize.org.

Week 4, 5, & 6:

Auctions, Theory and Practice

- Krishna, Vijay. *Auction theory*. Academic press, 2009.
- Myerson, Roger B. “Optimal auction design.” *Mathematics of operations research* 6, no. 1 (1981): 58-73.
- Milgrom, Paul R., and Robert J. Weber. “A theory of auctions and competitive bidding.” *Econometrica: Journal of the Econometric Society* (1982): 1089-1122.

- Klemperer, Paul. “What really matters in auction design.” *The Journal of Economic Perspectives* 16, no. 1 (2002): 169-189.

Week 7:

Double Auction

- Myerson, Roger B., and Mark A. Satterthwaite. “Efficient mechanisms for bilateral trading.” *Journal of economic theory* 29, no. 2 (1983): 265-281.
- McAfee, R. Preston. ”A dominant strategy double auction.” *Journal of economic Theory* 56, no. 2 (1992): 434-450.

Week 8, 9, & 10:

Basic Theory of Two-sided Matching

1. Matching with Non-transferable Utilities, Stability and the Gale-Shapley Algorithm
 - Roth-Sotomayor (chapter 2)
 - (*) Gale, David and Lloyd Shapley (1962), *College Admissions and the Stability of Marriage*, *American Mathematical Monthly*, 69, 9-15.
2. Many-to-one Matching
 - Roth-Sotomayor (chapter 5)
3. Properties of Stable Matchings
 - Roth-Sotomayor (chapter 3)
 - Adachi, Hiroyuki. “On a characterization of stable matchings.” *Economics Letters* 68.1 (2000): 43-49.
4. Matching with Transferable Utilities (Assignment Game)
 - Roth-Sotomayor (chapter 8)
 - Shapley, Lloyd S., and Martin Shubik. “The assignment game I: The core.” *International Journal of Game Theory* 1.1 (1971): 111-130.

Week 11:

Mechanism Design Aspects of Matching

1. Stable Matching Mechanisms

- Roth, Alvin E. (2002), The Economist as Engineer: Game Theory, Experimental Economics and Computation as Tools of Design Economics, *Econometrica*, 70(4), 1341-1378.

2. Strategic Issues

- Roth-Sotomayor (chapters 4 and 5)
- Gabrielle Demange; David Gale (1985), “The Strategy Structure of Two-Sided Matching Markets,” *Econometrica*, 53(4), 873-888.
- Roth, Alvin E., and John H. Vande Vate. “Incentives in two-sided matching with random stable mechanisms.” *Economic Theory* 1.1 (1991): 31-44.
- Kesten, Onur. “On two kinds of manipulation for school choice problems.” *Economic Theory* 51.3 (2012): 677-693.

3. Unraveling

- Li, Hao, and Wing Suen. “Risk sharing, sorting, and early contracting.” *Journal of Political Economy* 108.5 (2000): 1058-1091.
- Du, Songzi, and Yair Livne. Unraveling and Chaos in Matching Markets. mimeo, 2011.
- Roth, Alvin E. “A natural experiment in the organization of entry-level labor markets: regional markets for new physicians and surgeons in the United Kingdom.” *The American economic review* (1991): 415-440.

Week 12:

Random Assignment Problems

- Shapley, Lloyd, and Herbert Scarf. “On cores and indivisibility.” *Journal of mathematical economics* 1.1 (1974): 23-37.
- Bogomolnaia, Anna, and Herv Moulin. “A new solution to the random assignment problem.” *Journal of Economic Theory* 100.2 (2001): 295-328.
- Budish, E., Che, Y. K., Kojima, F., & Milgrom, P. (2013). Designing random allocation mechanisms: Theory and applications. *The American Economic Review*, 103(2), 585-623.

- Pycia, Marek, and M. Utku Ünver. “Incentive compatible allocation and exchange of discrete resources.” Available at SSRN 1079505 (2014).

Week 13 & 14:

Applications

1. National Resident Matching Program

- Roth, Alvin E. and Peranson, E. (1999). “The Redesign of the Matching Market for American Physicians: Some Engineering Aspects of Economic Design.” *American Economic Review* (American Economic Association) 89 (4): 748-780
- (*) Roth, Alvin E. “The evolution of the labor market for medical interns and residents: a case study in game theory.” *The Journal of Political Economy* (1984): 991-1016.

2. Public School Choice Programs

- Atila Abdulkadiroglu and Tayfun Sonmez. “School Choice: A Mechanism Design Approach.” *The American Economic Review*, Vol. 93, No. 3.
- Parag Pathak and Tayfun Sonmez, “School Admissions Reform in Chicago and England: Comparing Mechanisms by Their Vulnerability to Manipulation”, *American Economic Review*, 103(1): 80-106, February 2013.

3. Organ Donation Exchanges

- Roth, Alvin E., Tayfun Sonmez, and M. Utku Ünver, “Efficient kidney exchange: Coincidence of wants in markets with compatibility-based preferences.” *The American economic review* (2007): 828-851.

4. Housing Allocation

- Atila Abdulkadiroglu and Tayfun Sonmez, “Random Serial Dictatorship and the Core from Random Endowments in House Allocation Problems.”, *Econometrica*, May 1998.