ECON 1465 - Market Design: Theory and Applications
Brown University
Fall 2012

Lecture: Wednesday 3-5:20pm in Alumnae Hall 212
Conference: Monday 7-7:50pm in Sayles 005
              Tuesday 7-7:50pm in Sayles 005

Instructor: Itay Fainmesser (email: Itay_Fainmesser@Brown.edu)
Office: Robinson 303D
Office hours: Wednesday 12-1pm
              Thursday 10:30-11:30am

Teaching Assistant: John McNeill (email: John_McNeill@brown.edu)
Office hours: Tuesday 3-5pm in the basement of Robinson hall.
* Students are encouraged to email John with questions in advance, before to coming to office hours.

Course description

This course studies the design of organized markets, focusing on efficient organization and the incentives created by market rules. The analysis relies on a mix of documenting the rules of real-world markets, game theoretic analysis, empirical analysis, and experimental work.

Applications include:
- Online auction markets - e.g. eBay, Amazon
- Ad auctions - e.g. Google
- Matching markets
    - Matching students to schools
    - Matching workers to job: medical residents to hospitals, lawyers to clerkship positions
    - Matching kidney donors to recipients
    - Online dating

Prerequisites

ECON 1110 (Intermediate Microeconomics) or ECON 1130 (Intermediate Microeconomics, Mathematical), MATH 0090 or equivalent.

While not a prerequisite, a strong background in Game Theory is a plus.

Readings

A good introduction to Market Design can be found in the following papers:

- Roth, Alvin E. "What have we learned from market design?" Hahn Lecture, Economic Journal, 118 (March), 2008, 285-310. (You can see the lecture live here: http://www.bu.edu/buniverse/view/?v=grOprKV)
- Roth, Alvin E. "The Economist as Engineer: Game Theory, Experimental Economics and Computation as Tools of Design Economics," Econometrica, 70, 4, July 2002, 1341-1378. (Or see Hal Varian's much briefer NY Times column on this paper at http://people.ischool.berkeley.edu/~hal/people/hal/NYTimes/2002-08-29.html)
- Paul Milgrom, "http://www.stanford.edu/~milgrom/publishedarticles/Auctions%20and%20Bidding%20Primer.pdf", *Journal of Economic Perspectives*, 3, Summer 1989, 3-22.

There are two reference books that are recommended and include much of the theoretical material covered in class (and a lot more):

- Al Roth and Merilda Sotomayor, *Two-Sided Matching*, Cambridge University Press, 1990.
- Paul Klemperer, Auctions: Theory and Practice, Princeton University Press, 2004. (available online at: http://www.gqq10.dial.pipex.com/)

The schedule below includes a long list of relevant readings. Items marked with * will be discussed in class and are required readings. The schedule is tentative and will be modified throughout the semester based on students' interests and logistical constraints.

There are also a few blogs on market design that some of you may find extremely interesting and can provide you with ample ideas for great term papers. Two that come to mind are:

- Al Roth's blog on Market Design (a must-read for any Market Designer): http://marketdesigner.blogspot.com/
- Noam Nisan's Algorithmic Game Theory – Economics Blog (especially interesting for Math-ECON, Applied Math-ECON, and CS-ECON concentrators): http://agtb.wordpress.com/

Problem sets

Two problem sets will be assigned. Groups of students may collaborate on an assignment, but each student must write up his/her own assignment individually. An assignment must be handed in at the beginning of class on the date it is due. Late assignments will not be accepted.

The problem sets are designed as learning experience. A great emphasis should be put on working through each problem.

The problem sets will be graded based on the amount of work that appears to have been invested in reaching a solution. A complete and correct solution that includes all of the steps in solving a problem will achieve the maximum score. A solution that includes most of the steps yet reaches a wrong conclusion, or a solution that includes coherent steps, even if wrong, will achieve many of the points. A correct solution which does not go through the necessary steps will not always achieve the maximal score.

Referee report

Each student is required to write a 2-3 page referee report for an academic paper. A paper for the report will be assigned by the instructor. Referee reports should be typed in font size 12 with line spacing of 1.5 and at least one inch margins on all sides. Referee reports must be handed in at the beginning of class on the date they are due. Late assignments will not be accepted.

In-class presentation and final paper

Each student (possibly in pairs) is required to submit a final paper that reviews existing literature on a topic in market design by **December 14**. Late submissions will be considered only based on a written letter from Dean David Targan.

While topics will be approved on an individual basis, there are three types of papers that are recommended:
- A review of a question that is discussed in the academic literature on market design. The review should be detailed and show complete understanding of the model, or econometrics used in at least one paper that was published in an economic journal, or was written by a serious economist (consult with me on the paper when in doubt).
- A review of a real-world market, with focus on the market's rules, strengths and weaknesses of the existing design, and relevant academic literature. This is a challenging format for a paper and you should approve with me the exact focus of your paper prior to your presentation in class.
- A research proposal that is related to Market Design. This format is the most difficult to accomplish. You are required to approve with me the exact focus and outline of the proposal before your presentation in class (this is recommended ONLY for students that plan to follow up with an honors thesis and have at least one more year of undergraduate studies after the end of the semester in which they take the course).

The paper is limited to no more than 15 pages. Grading of longer papers will be done based on the first 15 pages. Final papers should be typed in font size 12 with line spacing of 1.5 and at least one inch margins on all sides. Final papers should be submitted electronically.

Students should submit a 1-2 page topic proposal. A proposal includes a description of the topic and planned layout of the paper, as well as a succinct description of the work already done. Proposals should be typed in font size 12 with line spacing of 1.5 and at least one inch margins on all sides. Proposals must be handed in at the beginning of class on the date they are due. Late assignments will not be accepted.

Each student (possibly in pairs) is required to prepare a 20-30 minute presentation motivating and previewing their final paper. Presentation times will be assigned individually at the discretion of the instructor for a class between **November 14** and **December 5**. The date assigned is not negotiable, and changes will be considered only based on a written letter from Dean David Targan.

*Students interested in using the final paper and in-class presentation to fulfill their capstone requirement are encouraged to talk to me about this option when submitting their proposal.

Grading

Your course grade will be based on problem sets, in-class presentation, final paper, and class participation.

Problem sets:	15%
Referee report:	20%
In-class presentation and Final paper:	55%
Class participation	10%

Corrected assignments will be available in the class mailbox (in the basement of Robinson hall) at most six days after the deadline or the date of the assignment. Students then have at most *eight* days to introduce a complaint regarding a grade (that means exactly two weeks after the deadline or the date of the assignment). Requests must be placed in my mailbox in Robinson hall (room 103). I expect them to be specific and motivated. This means that you must include a copy of the submitted assignment, and an explanation as to why the question(s) need(s) to be regarded. If I find the request motivated, then I will re-grade these question(s) myself (which may possibly result in a lower grade if I find it justified).

Laptops and cell phones policy

Laptops and cell phones should be turned off and put away during class and section.

Office Hours

Office hours are a great learning opportunity. Please come to my and the teaching assistant's office hours with questions on the material covered in class, comments on the course, and in order to discuss ideas for your final paper. Please also come to my office hours if you want to talk about anything in Economics.

Please do not use either my or the teaching assistant's office hours to talk about grades.

Schedule (tentative)

September 5: **No class - Opening Convocation**

September 12: **Introduction and Matching Theory**
- Roth, Alvin E. "The Economist as Engineer: Game Theory, Experimental Economics and Computation as Tools of Design Economics," Econometrica, 70, 4, July 2002, 1341-1378.
  http://kuznets.fas.harvard.edu/~aroth/papers/engineer.pdf
- Roth, Alvin E. "What have we learned from market design?" Hahn Lecture, Economic Journal, 118 (March), 2008, 285-310.
  http://kuznets.fas.harvard.edu/~aroth/papers/2008_Hahn_Lecture_EJ.pdf

- Gale, David and Lloyd Shapley [1962], "College Admissions and the Stability of Marriage," *American Mathematical Monthly*, 69, 9-15.
  http://www.jstor.org/stable/10.2307/2312726
- * Roth, A.E. and M. Sotomayor *Two-Sided Matching: A Study in Game-TheoreticModeling and Analysis*, Econometric Society Monograph Series, Cambridge University Press, 1990. (Chapters 2.1-4.3)
- Paul Klemperer, Auctions: Theory and Practice, Princeton University Press, 2004. (Chapter 1 section 1)

September 19: **Matching Theory II and NRMP design (problem set #1 assigned)**
- Roth, A.E., "The Evolution of the Labor Market for Medical Interns and Residents: A Case Study in Game Theory," Journal of Political Economy, 92, 1984, 991-1016.
  http://kuznets.fas.harvard.edu/~aroth/papers/evolut.pdf
- * Roth, A.E. and M. Sotomayor *Two-Sided Matching: A Study in Game-Theoretic Modeling and Analysis*, Econometric Society Monograph Series, Cambridge University Press, 1990. (Chapter 5)

September 26: **No class – Yom Kippur**

October 3: **Congestion in Matching Markets: the Market for Clinical Psychologists, college admission, AEA signaling, online dating (problem set #1 due, referee report assigned)**

- * Roth, A.E. and X. Xing "http://kuznets.fas.harvard.edu/~aroth/papers/RothXingJPE97.pdf," Journal of Political Economy, 105, April 1997, 284-329.
- Coles, Peter, Alexey Kushnir and Muriel Niederle, Preference Signaling in Matching Markets **"http://www.stanford.edu/~niederle/SignalingPaper.pdf"**, working paper, 2010.
- Lee, Soohyung, and Muriel Niederle, "Propose with a Rose? Signaling in Internet Dating Markets," working paper, December 2009. http://www.stanford.edu/~niederle/Roses.Lee.Niederle.pdf
- Avery, Christopher, Andrew Fairbanks and Richard Zeckhauser, *The Early Admissions Game: Joining the Elite*, Harvard University Press, Cambridge, MA 2003.
- Avery, Christopher and Jonathan Levin, "Early Admissions at Selective Colleges," Forthcoming, American Economic Review. http://www.stanford.edu/~jdlevin/Papers/EarlyAdmissions.pdf
- * Peter Coles, John Cawley, Phillip B. Levine, Muriel Niederle, Alvin E. Roth, and John J. Siegfried , "The Job Market for New Economists: A Market Design Perspective" http://kuznets.fas.harvard.edu/~aroth/papers/AEA%20jobmarket%202010.pdf revised April 6, 2010, forthcoming in Journal of Economic Perspectives, Fall 2010.

October 10: **Auction Theory and online applications: eBay vs. Amazon**

- * Paul Klemperer, Auctions: Theory and Practice, Princeton University Press, 2004. (Ch. 1 section 1 - 6)
- * Roth, Alvin E. and Axel Ockenfels, "Last-Minute Bidding and the Rules for Ending Second-Price Auctions: Evidence from eBay and Amazon Auctions on the Internet," *American Economic Review*, 92 (4), September 2002, 1093-1103. http://kuznets.fas.harvard.edu/~aroth/papers/eBay.veryshortaer.pdf (Press coverage: See Hal Varian's NY Times column (http://www.nytimes.com/2000/11/16/technology/16SCEN.html?printpage=yes)on this work, a piece in SIAM news (http://www.siam.org/news/news.php?id=304), a brief account from HBS Working knowledge (http://hbswk.hbs.edu/item.jhtml?id=4662&t=special_reports), and articles in USA Today (http://www.usatoday.com/tech/science/columnist/2006-06-25-physics-of-ebay_x.htm?POE=click-refer) and New Scientist (http://www.newscientist.com/article.ns?id=dn9398)). The data from that study are posted here (http://ockenfels.uni-koeln.de/publikationen.html?id=41&no_cache=1&tx_ockresearch_pi1%5Btype%5D=0&tx_ockresearch_pi1%5Bdate%5D=2002&tx_ockresearch_pi1%5Buser%5D=0).

- * Ariely, Dan, Axel Ockenfels, and Alvin E. Roth, "An Experimental Analysis of Ending Rules in Internet Auctions," *Rand Journal of Economics*, 36, 4, Winter 2005, 891-908. http://kuznets.fas.harvard.edu/~aroth/papers/eBay.experiment.pdf
- Ockenfels, Axel and Alvin E. Roth, "Late and Multiple Bidding in Second-Price Internet Auctions: Theory and Evidence Concerning Different Rules for Ending an Auction," *Games and Economic Behavior*, 55, 2006, 297-320 http://kuznets.fas.harvard.edu/~aroth/papers/equilibrium.geb.pdf
- Axel Ockenfels and Alvin E. Roth, "The Timing of Bids in Internet Auctions: Market Design, Bidder Behavior, and Artificial Agents," *AI Magazine*, Fall 2002, 79-88. http://kuznets.fas.harvard.edu/~aroth/papers/eBay.ai.pdf
- Gary Bolton, Ben Greiner, and Axel Ockenfels, "Engineering Trust - Reciprocity in the Production of Reputation Information" [http://econpapers.repec.org/RePEc:kls:series:0042]

October 17: **eBay vs. Amazon (referee report due, problem set #2 assigned)**
- See readings for the previous week

October 24: **Guest speaker – Itai Ashlagi: Kidney Exchange (problem set #2 due)**
- Roth, Alvin E., Tayfun Sonmez , and M. Utku Unver, "A Kidney Exchange Clearinghouse in New England" *American Economic Review, Papers and Proceedings*, 95,2, May, 2005, 376-380. http://kuznets.fas.harvard.edu/~aroth/papers/KidneyAEAPP.pdf
- * Roth, Alvin E., Tayfun Sonmez, and M. Utku Unver, "Kidney Exchange," *Quarterly Journal of Economics*, 119, 2, May, 2004, 457-488. (Originally published as NBER Paper w10002, September 2003). http://kuznets.fas.harvard.edu/~aroth/papers/kidney.qje.pdf
- Roth, Alvin E., Tayfun Sonmez , and M. Utku Unver, "Efficient Kidney Exchange: Coincidence of Wants in Markets with Compatibility-Based Preferences," (May, 2005. NBER Paper w11402), *American Economic Review,* 97, 3, June 2007, 828-851. http://kuznets.fas.harvard.edu/~aroth/papers/Kidney3way.pdf
- Utku Unver, "Dynamic Kidney Exchange*,"* Review of Economic Studies*, (January 2010) 77 (1): 372-414. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=969852
- * Ashlagi, Itai, and Al Roth, "New challenges in multi-hospital kidney exchange," *American Economic Review (P&P)*, forthcoming. http://web.mit.edu/iashlagi/www/papers/KidneyExchange%20AEAPP2012.pdf

October 31: **Guest Speaker – Jacob Leshno (term paper proposals due)**
- * Background on Little's law (focus on pages 81 to 87): http://web.mit.edu/sgraves/www/papers/Little's%20Law-Published.pdf
- * Very basic background on Markov Chains:

http://en.wikipedia.org/wiki/Markov_chain

- Jacob D. Leshno, Dynamic Matching in Overloaded Systems, in *working paper*, 2012.
  http://research.microsoft.com/pubs/172499/Dynamic_Matching_v1_8.2.pdf

November 7: **Guest Speaker – Ehud Adiri**

November 14: **Students' Presentations**

November 21 – no class, Thanksgiving

November 28: **Students' Presentations**

December 5: **Students' Presentations + discussion: what have we learned from market design?**

December 14th: **No class – deadline for submission of the term paper**