

## **Syllabus**

We will start out by covering some of the main topics in auction theory with independent private values and related topics in mechanism design. These are listed under the first two groups of papers below. Next, we will talk about matching theory, connections between matching theory and auction theory, and some applications (specifically, sponsored search auctions). We will also talk about information in auctions (covering such topics as auctions with interdependent/common values, winner's curse, and others). We will conclude with presentations by graduating PhD students discussing their work.

There will be lecture notes for *some* of the lectures – I will post them on coursework. I also expect you to read the book(s) whenever the topic is covered in them, and also some of the papers (I will usually tell you which ones are particularly worth reading).

There will be four graded homework assignments. All problems will be on coursework. I will post solutions there as well. There will also be one “referee report” assignment midway through the course. At the end, there will be a 24-hour take-home final exam.

Recommended textbooks for auction topics are:

Vijay Krishna, “Auction Theory”, 2<sup>nd</sup> ed. (free at <http://searchworks.stanford.edu/view/8579790>)

Paul Milgrom, “Putting Auction Theory to Work”

Paul Klemperer, “Auctions: Theory and Practice” (free at <http://www.paulklemperer.org/index.htm>)

For matching, the textbook is “Two-sided matching” by Roth and Sotomayor.

“\*” in the list of papers indicates the main readings.

### **1. Introduction to Auctions; Revenue Equivalence**

\* William Vickrey (1961), "Counterspeculation, Auctions, and Competitive Sealed Tenders", *Journal of Finance*, XVI, 8-37.

\* Vijay Krishna “Auction Theory” Chapters 2, 3.

Paul Milgrom “Putting Auction Theory to Work” Chapters 1, 2.

R. Preston McAfee; John McMillan (1987) “Auctions and Bidding” *Journal of Economic Literature*, Vol. 25, No. 2. (Jun., 1987), pp. 699-738.

Paul Milgrom “Auctions and Bidding (1989): A Primer” *The Journal of Economic Perspectives*, Vol. 3, No. 3. (Summer, 1989), pp. 3-22.

Paul Klemperer (1999). "Auction Theory: A Guide to Literature." *Journal of Economic Surveys* 13(3): 227-286.

Milgrom, Paul R. and Segal, Ilya R., Envelope Theorems for Arbitrary Choice Sets. *Econometrica*, Vol. 70, pp. 583-601, 2002.

## **2. Mechanism Design, Optimal Auctions, Bargaining (Independent Private Values)**

\* Roger B. Myerson (1981), "Optimal Auction Design", *Mathematics of Operations Research*, 6 (1), February 58-73.

\* Roger B. Myerson and Mark A. Satterthwaite (1983), "Efficient Mechanisms for Bilateral Trading", *Journal of Economic Theory*, 29 (2), April 265-81.

\* Jeremy Bulow and John Roberts (1989), "The Simple Economics of Optimal Auctions", *Journal of Political Economy* 97 (5), October 1060-90.

\* Jeremy Bulow and Paul Klemperer (1996), "Auctions versus Negotiations", *American Economic Review*, 86 (1), March 180-94.

\* Vijay Krishna "Auction Theory" Chapter 5.

Paul Milgrom "Putting Auction Theory to Work" Chapters 3,4

\* Peter Cramton, Robert Gibbons, and Paul Klemperer (1987), "Dissolving a Partnership Efficiently", *Econometrica*, 55 (3), May, 615-32.

John G. Riley and William F. Samuelson (1981), "Optimal Auctions", *American Economic Review*, 71 (3), June 381-92.

## **3. Linkage Principle, Affiliation, Common and Interdependent Values, Auctions with Contingent Payments**

Robert G. Hansen (1985), "Auctions with Contingent Payments", *American Economic Review*, 75 (4) (September, pp. 862-865.

\* DeMarzo, P., Kremer, I. and Skrzypacz, A. (2005), "Bidding with Securities: Auctions and Security Design," *American Economic Review* 95 (4) September, 936 – 959.

Gorbenko, Alexander S. and Malenko, Andrey, Competition among Sellers in Securities Auctions (July 19, 2010). *American Economic Review*, Forthcoming: <http://ssrn.com/abstract=1102664>

\* Paul R. Milgrom and Robert J. Weber (1982a), "A Theory of Auctions and Competitive Bidding", *Econometrica* 50 (5), September, 1089-122.

\* Paul R. Milgrom and Robert J. Weber (1982b), "The Value of Information in a Sealed-Bid Auction", *Journal of Mathematical Economics*, 10 (1), June, 105-14.

\* Vijay Krishna "Auction Theory" Chapters 6, 7 and 10.

Paul Milgrom "Putting Auction Theory to Work" Chapter 5.

Jacques Cremer and Richard P. McLean (1985) "Optimal Selling Strategies Under Uncertainty for a Discriminating Monopolist When Demands are Interdependent", *Econometrica* 53 (2), March 345-61.

John G. Riley (1988), "Ex Post Information in Auctions", *Review of Economic Studies* LV (3), No. 183, July, 409-29.

R. Preston McAfee and John McMillan, "Competition for Agency Contracts", *RAND Journal of Economics*, 18 (2) (Summer, 1987), pp. 296-307.

Richard Engelbrecht-Wiggans, Paul R. Milgrom, Robert J. Weber (1983) "Competitive Bidding and Proprietary Information," *Journal of Mathematical Economics*, 11, 161-169.

Kenneth Hendricks and Robert H. Porter (1988) "An Empirical Study of an Auction with Asymmetric Information", *American Economic Review*, 78, (5), pp. 865-883.

Kenneth Hendricks; Robert H. Porter; Charles A. Wilson (1994) "Auctions for Oil and Gas Leases with an Informed Bidder and a Random Reservation Price," *Econometrica*, 62, (6). pp. 1415-1444.

Paul Povel, Rajdeep Singh "Stapled Finance" *The Journal of Finance* Volume 65, Issue 3, pages 927-953, June 2010.

Yeon-Koo Che and Jinwoo Kim (2010) "Bidding with Securities: Comment" *American Economic Review*, 2010, vol. 100, issue 4, pages 1929-35

#### **4. Matching theory**

\* Alvin Roth and Marilda Sotomayor, "Two-sided matching". Chapters 2, 3, 4, 7, 8.1, 8.2.

\* Gale, David, and Lloyd Shapley (1962). "College admissions and the stability of marriage," *American Mathematical Monthly*.

\* Shapley, Lloyd and Martin Shubik (1972). "The assignment game I: the core," *International Journal of Game Theory*.

\* Crawford, Vincent, and Elsie Marie Knoer (1981). "Job matching with heterogeneous firms and workers," *Econometrica*.

\* Kelso, Alexander, and Vincent Crawford (1982). “Job matching, coalition formation, and gross substitutes.” *Econometrica*.

Adachi, Hiroyuki (2000). “On a Characterization of Stable Matchings.” *Economics Letters*, 68(1): 43–49.

Echenique, Federico, and Jorge Oviedo (2004). “Core Many-to-One Matchings by Fixed-Point Methods.” *Journal of Economic Theory*, 115(2): 358–76.

\* Hatfield, John William, and Paul R. Milgrom (2005). “Matching with Contracts.” *American Economic Review*, 95(4): 913-35.

Sun, Ning, and Zifu Yang. 2006. “Equilibria and Indivisibilities: Gross Substitutes and Complements,” *Econometrica*, 74(5): 1385–1402

\* Ostrovsky, Michael (2008). “Stability in Supply Chain Networks.” *American Economic Review*.

\* Hatfield, John William, Scott Duke Kominers, Alexandru Nichifor, Michael Ostrovsky, and Alexander Westkamp (2011). “Stability and Competitive Equilibrium in Trading Networks,” working paper.

## **5. Multi-unit auctions, VCG, and connections to matching**

\* Vijay Krishna, “Auction Theory”, Chapters 12, 13, 14, 16.

\* Paul Milgrom, “Putting Auction Theory to Work”, Chapter 2.

\* Alvin Roth and Marilda Sotomayor, “Two-sided matching”, Chapters 8.3, 8.4.

“Combinatorial Auctions”, edited by P. Cramton, Y. Shoham, and R. Steinberg

\* Larry Ausubel and Paul Milgrom, “The Lovely but Lonely Vickrey Auction” (Chapter 1 in “Combinatorial Auctions”)

\* Leonard, Herman B. (1983). “Elicitation of honest preferences for the assignment of individuals to positions,” *Journal of Political Economy*.

\* Demange, Gabrielle, David Gale, and Marilda Sotomayor (1986). “Multi-item auctions.” *Journal of Political Economy*.

Gul, Faruk, and Ennio Stacchetti (1999). “Walrasian Equilibrium with Gross Substitutes.” *Journal of Economic Theory*.

Gul, Faruk, and Ennio Stacchetti (2001). “The English Auction with Differentiated Commodities.” *Journal of Economic Theory*.

Larry Ausubel and Paul Milgrom, "Ascending Auctions with Package Bidding." *Frontiers of Theoretical Economics*.

## **6. Internet advertising auctions**

Vijay Krishna, "Auction Theory", Chapter 17.

B. Edelman and M. Ostrovsky (2007). "Strategic Bidder Behavior in Sponsored Search Auctions," *Decision Support Systems*.

\* B. Edelman, M. Ostrovsky, and M. Schwarz (2008). "Internet Advertising and the Generalized Second Price Auction: Selling Billions of Dollars Worth of Keywords," *American Economic Review*.

Hal R. Varian (2007), "Position Auctions", *International Journal of Industrial Organization*.

Edelman, Benjamin G., and Michael Schwarz (2010). "Optimal Auction Design and Equilibrium Selection in Sponsored Search Auctions." *American Economic Review P&P*.

\* Michael Ostrovsky and Michael Schwarz (2009), "Reserve Prices in Internet Advertising Auctions: A Field Experiment", working paper.

Sebastien Lahaie and David M. Pennock (2007), "Revenue Analysis of a Family of Ranking Rules for Keyword Auctions", ACM EC '07.

Gomes, Renato and Kane Sweeney (2011), "Bayes-Nash Equilibria of the Generalized Second-Price Auction," working paper.

## **7. Presentations by Graduating PhD students**

Roth, A. E. and X. Xing (1994). "Jumping the Gun: Imperfections and Institutions Related to the Timing of Market Transactions," *American Economic Review*, 84.

Du, Songzi, and Yair Livne (2011). "Unraveling and Chaos in Matching Markets." Stanford GSB working paper.

Lazarev, John (2012). "How Firms Can Get More from Less: An Airline Pricing Puzzle." Stanford GSB working paper.