# An Outline of a Graduate, Mini-Course on Auctions, in the Department of Economics the Hebrew University, Jerusalem, Israel November- December, 2007

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**Short Course Description:**   Auctions are among the oldest and robust institutions for exchange. In the last twenty-five years we have seen an unprecedented interest in auctions from theoretical and practical perspectives.  The use of auctions increased dramatically both in scope and volume of transactions.  Auctions are now routinely used to sell spectrum rights, privatization schemes, finance national debt and over the Internet (between producers and consumers as well as between business to business for intermediate goods markets).  In this course we start with Vickrey's 1961 seminal work and build upon it by using modern tools of game theory with incomplete information. We will derive and characterize equilibria of the various auctions, analyze and compare their performances in terms of allocation efficiency and/or revenues capabilities.

Many economists regard auction theory as the best application of game theory to economics.  As such, auctions are (or ought to be) of interest also to the non specialists as they provide a model (canvas) to address many of the most fundamental questions in economics such as:  price formation, information aggregation by non-centralized institutions, public policy issues (e.g., choice of auctions, providing additional information, helping "weak" bidders, allowing joint bidding) as well as behavioral and bounded rationality aspects.

It is impossible to be conclusive and do "justice" to this area in microeconomic theory in a series of 6-7 lectures.  We will start at the "beginning" and cover many of the baseline models. But then, my selection will be biased toward areas that I have researched over the years.  I will also insert from time to time evidence from experimental work in the relevant areas (usually where I was involved.)

Immediately following this short description an outline of topics to be covered in our six meetings is presented.  The relevant readings are marked with a number from the list of references next to each topic.  The reference list is produced (more as a menu) for the interested students and mainly for future reference. The more direct and relevant papers (or parts of them) will be covered in class and they are marked by an asterisk**\***.

Please note and mark the days, place and time of our meetings. I strongly recommend attending all classes.  My contact information is above. I plan to "be around" during the two weeks of the course (November 25 to December 6, 2007), and by arrangement (e-mail) for additional two weeks.  I welcome and encourage students to see me.

**Lecture I**  (Sunday, November 25, 2007, 10:30-12:00)

**1. Course Organization and Structure.**

**Lectures, Timing, Readings, Exam (Term paper), Presentations, Grades.**

**2. Introduction.**

A brief history, motivation and importance of Auctions. {Books, Surveys, [15]}.

- One of the oldest mechanism/institution of selling and/or buying (exchange), Robust.

- Best application of GT (games with incomplete information).

- Volume of transaction, "billions and billions": Spectrum rights (FCC); mineral rights (e.g., OCS oil drilling rights in the Gulf of Mexico; traditional auctions (e.g., fish, flowers, art and antiques); government securities (financing the debt, T-bills); More recent, internet auctions B2C and B2B (eBay Amazon); privatization schemes in general and particularly in emerging democracies. Trading pollution rights.

**3. Issues.  A short review of the many issues addressed in the auction litterateur.**

- Equilibrium (G-T's prediction vs. behavior), comparing auctions' performance – Efficiency and Revenue- and Optimal auction design. Reserve price (secret or not).
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4. **A way to think about the literature:**

   **Rules of the Game $\times$ Information Structure $\times$ Bidders' Preference. (show matrix). E.g. FPA $\times$ independent signals $\times$ risk neutral bidders with private values.**

5. **Rules of some of the "standard/simple" Auctions.**

   - **Sealed-Bid First-Price-Auction (SBFPA).**

   - **Sealed-Bid Second-Price-Auction (SBSPA).**

   - **English Auction.**

   - **Dutch Auction.**

   - **Sealed-Bid K$^{th}$-Price-Auction (SBKPA).**

6. **Information Structure:**

   - **I.I.D Signals.**

   - **Correlated Signals.**

7. **Bidders' Valuation/(Preferences).**

   a. **Private Values.**

   b. **Interdependent Valuation**

   c. **Common Values/General.**

**Lecture II** (Tuesday, November 27, 2007, 10:30-12:00)

**Single unit, Private-Values-Auctions**

**1.  The Independent-Private-Values (IPV) Model:**

- The assumptions and the model.

- Deriving equilibria of the "standard" auctions. (Use other trans.)

- Strategic equivalence; Revenue Equivalence Theorem; Optimal Auctions {R&S*, *AER*, 81; Myerson*, *MOR,* 81; B&R, *JPE,* 89; B&K, *AER* 96; Vickrey, *JF,* 61} (Use other trans.)

**2.  The role of Risk-Aversion and The number of Bidders:**

- Theoretical predictions from First-, Second-, and Third-Price auctions. {K&L*, *EJ*, 93; L&S, *EJ,* 96}.

**3.  Experimental evidence.** {KHL*, *Econometrica*, 87; K&L*, *EJ*, 93}

**Lecture III** (Thursday, November 29, 2007, 10:30-12:00)

- **The Independent-Interdependent-Values (IIV) Model:** First encounter with the *Winner's Curse* (WC), or "When and Why not to Auction." {[10]*}.

- **The Common-Values Model:** Equilibrium, the WC. {[7], [8], [31]*}.

1. **Experimental evidence.** {[11]*, [18]}.

**Lecture IV** (Sunday, December 2, 2007, 10:30-12:00)

- **The Common-Values Model** (once more)**:** Equilibrium, Information aggregation {[31]*, [27]}.

- **Convergence**. {[27], [31]*}.

- **The General Affiliation Model:** Affiliation, the *linkage principle.* {[28]*}.

**Lecture V** (Tuesday, December 4, 2007, 10:30-12:00)

- **Almost Common-Value model**. Theory and experimental evidence. {[3], [4], [16]*, [19]*}.

- **Endogenous entry.** {[21]*}.

- **Auctions with an Insider.** {[9]*, [13]}.


**Lecture VI** (Thursday, December 6, 2007, 10:30-12:00)

As time permits accounting for students' preferences.

- **Multiple-Units Auctions**. Demand Reduction. Efficient auctions (static and dynamic). Clinching (Ausubel) auctions. {[1], [14], [17]*, [23]}.

- **Multiple-Units Auctions with Synergies:** Combinatorial auctions, the threshold and the exposure problems. {[32]}.

- **Stochastic number of bidders**. The risk aversion approach with EU bidders. The ambiguity aversion approach with MMEU bidders. {[22]*, [24], [25]}.

- **Joint Bidding.** {[33]}

- **Indicative bidding.** {[34]}

# References:

**Please regard this partial reading list as a menu, as obviously you are not expected to read all that material in two weeks. We will try to cover many of those noted by (\*) in class.**

## I. Books

Cassidy R., 1967. <u>Auctions and Auctioneering</u>, Berkeley: University of California press.
Klemperer P., (Ed.), 2000. <u>The Economic Theory of Auctions</u>, Edward Elgar Publishing.
Vijay Krishna, 2002. <u>Auction Theory</u>, Academic Press.

## II. Surveys:

Kagel, J. H., 1995. "Auctions: A Survey of Experimental Research," in <u>The Handbook of Experimental Economics</u>, J. H. Kagel and A. E. Roth (eds). Princeton: Princeton University Press.

Kagel, J. H. and D. Levin, 2002. "Bidding in Common Value Auctions: A Survey of Experimental Research," in <u>Common-Value Auctions and the Winner's Curse</u>, Princeton University Press.

Klemperer, P., 1999. "Auction Theory: A guide to the Literature," *Journal of Economic Surveys,* 13: 227-260.

Klemperer, P., 2000. "Why every economist should learn some auction theory." invited paper from the Econometric Society World Congress.

McAfee, R.P., and J. McMillan, 1987. "Auctions and Bidding," *Journal of Economic Literature*, 25:699-738.

Wilson, R., 1992. "Strategic Analysis of Auctions," in R.J. Aumann and S. Hart, <u>Handbook of Game Theory with Economic Applications</u>, Vol. 1. Amsterdam: Elsevier Science Publishers.

**III. Articles**:

[1] Ausubel, L. M., 1997. "An Efficient Ascending-Bid Auction for Multiple Objects," mimeographed, University of  Maryland, 1997.

[2] Ausubel, Lawrence M. and Peter C. Cramton, (1996), "Demand Reduction and Inefficiency in Multi-Unit Auctions," WP # 96-07 University of Maryland.

[3] Avery, C. and J. H. Kagel, 1997. "Second-Price Auction with Asymmetric Payoffs: An Experimental Investigation," *Journal of Economics & Management Strategy,* 6, 573-603.

[4] Bikhchandani, S., 1988. "Reputations in Repeated Second-Price Auctions," *Journal of Economic Theory*, 46, 97-119.

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[8] Bulow, J., M. Huang, and P. Klemperer, P., 1999. "Toeholds and Takeovers," *Journal of Political Economy*, 107, 427-454.

[9]*Campbell, C. and D. Levin, 2000. "Can the Seller Benefit from an Insider in Common Value Auctions?" *Journal of Economic Theory*, 91: 106-120.

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[11]*Kagel, J. H. and D. Levin, 1986.  "The Winner's Curse and Public Information in Common Value Auctions," *American Economic Review*, 76:894-920.

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[13] Kagel, J. H. and D. Levin, 1999. "Common Value Auctions with Insider Information," *Econometrica*, 67 :1219-1238.

[14] Kagel, J. H. and D. Levin, 2001. "Behavior in Multi-Unit Demand Auctions: Experiments with Uniform Price and Dynamic Vickrey Auctions," *Econometrica*, 69: 413-454.

[15] Klemperer, P., 2002. "What Really Matters in Auctions Design," *Journal of Economic Perspectives.*

[16]*Klemperer, P., 1998. "Auctions with Almost Common Values," *European Economic Review*, 42, 757-69.

[17]*Levin D., 2003.  "Demand Reduction in Multi-Unit Auctions: Evidence from a Sportscard Field Experiment: A Comment," forthcoming, *American Economic Review.*

[18] Levin, D., J. H. Kagel and J. F. Richard, 1996. "Revenue Effects and Information Processing in English Common Value Auctions" *American Economic Review*, 86:442-460.

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[22] Levin, D. and E. Ozdenoren, 2003. "Auctions with Uncertain Number of Bidders," WP (posted on my web).

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[27] Milgrom, P. "A convergence Theorem for Competitive Bidding with Differential Information," Econometrica, 47(3) 679-88.

[28]*Milgrom, P., and R.J. Weber, 1982. "A Theory of Auctions and Competitive Bidding," *Econometrica*, 50:1485-527.

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[32] Chernomaz Kirill DD Levin "Efficiency and Synergy in a Multi-Unit Auction with and without Package bidding: an Experimental Study," WP OSU.

[33] Levin Dan, 2004) "The Competitiveness of Joint Bidding in Multi-Units Uniform-Price Auctions," *RAND Journal of Economics,* Vol. 35, No. 2, pp 373-385.

[34] Ye, Lixin, 2007, "Indicative Bidding and A Theory of Two-Stage Auctions," *Games and Economic Behavior, 58 (1): 181-207.*