**Market Design A (HUJI, Semester B, 2015-2016)**

Last updated ‏12/10/2015

This course aims to introduce concepts, approaches and results in the field of Market Design. Market Design can be roughly described as the attempt to study real markets and find practical ways to improve them, with a strong emphasis on matching markets. We will become familiar with the market designer toolbox, as well as review case studies that call for further expansion of the basic tools. In particular, we will consider one-sided and two-sided matching markets, learn algorithms that are useful in designing centralized matching systems, and try to rethink some of the recent design efforts that have been taking place in Israel and elsewhere in the world.

This course is intended for graduate (masters and PhD) students of Economics or at the Center for the Study of Rationality who are familiar with basic concepts in game theory. It is open (with instructor's permission) to any other student with the proper background.

The biggest motivation for this course is to encourage students (from all disciplines) to take active part in market design research, and produce a final project that may develop into a publishable paper. Therefore, each student will be required to submit a preliminary idea near the middle of the semester, and a final project up to one week after classes are done. Projects can be of different varieties (theoretical, experimental, practical redesign, or any other academically sound and well documented effort).

**Note:** PhD students in the Center for the Study of Rationality (but not students of Economics and CS!) may take this class for active participation. In this case I will only require attendance and a "referee report" of a recent paper (to be agreed upon together, according to the student's interests).

**Instructor:** Assaf Romm, Mount Scopus, Hevra 5226, [assaf.romm@mail.huji.ac.il](mailto:assaf.romm@mail.huji.ac.il), OH: Monday 10:00-11:00.

**Course requirements:** Attendance (up to 2 misses), reading the required readings and submitting one paragraph response, submitting a research idea in one paragraph half-way through the course, and a final paper (4-10 pages). Some students may be requested to do a class presentation on their final paper.

**Recommended textbook:**

* Roth, A. E., & Sotomayor, M. A. O. (1992). Two-sided matching: A study in game-theoretic modeling and analysis (No. 18). Cambridge University Press.

**Preliminary schedule and relevant bibliography:**

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| Date | Title | References |
| 22/2 | Introduction to Market Design | - Roth, A. E. (2002). The economist as engineer: Game theory, experimentation, and computation as tools for design economics. Econometrica, 1341-1378.  - Roth, A. E. (2008). What Have We Learned from Market Design? The Economic Journal, 118(527), 285-310. |
| 29/2 | One-sided matching | - Shapley, L., & Scarf, H. (1974). On cores and indivisibility. Journal of mathematical economics, 1(1), 23-37.  - Roth, A. E. (1982). Incentive compatibility in a market with indivisible goods. Economics letters, 9(2), 127-132. |
| 7/3 | Kidney exchange | - **\* Required \*** Roth, A. E. (2007). Repugnance as a Constraint on Markets. The Journal of Economic Perspectives, 21(3), 2.  - Roth, A. E., Sönmez, T., & Ünver, M. U. (2005). Pairwise kidney exchange. Journal of Economic theory, 125(2), 151-188.  - Ashlagi, I., & Roth, A. (2011, June). Individual rationality and participation in large scale, multi-hospital kidney exchange. In Proceedings of the 12th ACM conference on Electronic commerce (pp. 321-322).  - Ashlagi, I., Gamarnik, D., Rees, M. A., & Roth, A. E. (2012). The need for (long) chains in kidney exchange (NBER No. w18202). |
| 14/3 | The assignment problem | - Abdulkadiroğlu, A., & Sönmez, T. (1998). Random serial dictatorship and the core from random endowments in house allocation problems. Econometrica, 689-701.  - Hylland, A., & Zeckhauser, R. (1979). The efficient allocation of individuals to positions. The Journal of Political Economy, 293-314.  - Bogomolnaia, A., & Moulin, H. (2001). A new solution to the random assignment problem. Journal of Economic Theory, 100(2), 295-328.  - Kojima, F., & Manea, M. (2010). Incentives in the probabilistic serial mechanism. Journal of Economic Theory, 145(1), 106-123.  - Che, Y. K., & Kojima, F. (2010). Asymptotic equivalence of probabilistic serial and random priority mechanisms. Econometrica, 78(5), 1625-1672.  - Liu, Q., & Pycia, M. (2013). Ordinal efficiency, fairness, and incentives in large markets. Fairness, and Incentives in Large Markets (Working paper). |
| 21/3 | The Israeli medical match | - Budish, E. (2011). The combinatorial assignment problem: Approximate competitive equilibrium from equal incomes. Journal of Political Economy, 119(6), 1061-1103.  - 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.  - Nguyen, T., Peivandi, A., & Vohra, R. (2015). Assignment Problems with Complementarities (Working paper).  - Bronfman, S., Hassidim, A., Afek, A., Romm, A., Sherberk, R., Hassidim, A., & Massler, A. (2015). Assigning Israeli medical graduates to internships. Isr J Health Policy Res, 4(6).  - Alon, N., Bronfman, S., Hassidim, A., & Romm, A. (2015). Redesigning the Israeli Medical Internship Match (Working paper). |
| 28/3 | Stability in two-sided matching markets | - **\* Required \*** Gale, D., & Shapley, L. S. (1962). College admissions and the stability of marriage. American mathematical monthly, 9-15.  - Roth and Sotomayor, chapters 2-3, 5.  - Roth, A. E. (1984). The evolution of the labor market for medical interns and residents: a case study in game theory. The Journal of Political Economy, 991-1016. |
| 4/4 | Incentives and rank distribution under Deferred Acceptance | - Roth and Sotomayor, chapter 4.  - Roth, A. E. (1986). On the allocation of residents to rural hospitals: a general property of two-sided matching markets. Econometrica, 425-427.  - Immorlica, N., & Mahdian, M. (2005, January). Marriage, honesty, and stability. In Proceedings of the sixteenth annual ACM-SIAM symposium on Discrete algorithms (pp. 53-62).  - Kojima, F., & Pathak, P. A. (2009). Incentives and stability in large two-sided matching markets. The American Economic Review, 608-627.  - Lee, S. (2011). Incentive compatibility of large centralized matching markets. (Working paper).  - Ashlagi, I., Kanoria, Y., & Leshno, J. D. (2014). Unbalanced random matching markets: The stark effect of competition. (Working paper).  - Azevedo, E. M., & Leshno, J. D. (2014). A supply and demand framework for two-sided matching markets. Available at SSRN 2260567.  - Azevedo, E. M., & Budish, E. B. (2013). Strategy-proofness in the large. Chicago Booth Research Paper, (13-35).  - Roth, A. E., & Peranson, E. (1999). The Redesign of the Matching Market for American Physicians: Some Engineering Aspects of Economic D. American economic review, 89(4), 748-782. |
| 11/4 | The Israeli Psychology match | - Roth, A. E., & Xing, X. (1997). Turnaround time and bottlenecks in market clearing: Decentralized matching in the market for clinical psychologists. Journal of political Economy, 105(2), 284-329.  - Avery, C., & Levin, J. (2010). Early Admissions at Selective Colleges. The American Economic Review, 100(5), 2125-2156.  - Sönmez, T. (1999). Can pre-arranged matches be avoided in two-sided matching markets?. Journal of Economic Theory, 86(1), 148-156.  - Kojima, F., Pathak, P. A., & Roth, A. E. (2013). Matching with Couples: Stability and Incentives in Large Markets\*. The Quarterly Journal of Economics, 128(4), 1585-1632.  - Ashlagi, I., Braverman, M., & Hassidim, A. (2014). Stability in large matching markets with complementarities. Operations Research, 62(4), 713-732. |
| **Note: Research idea for final paper is due before next class.** | | |
| 16/5 | Mechanisms for school choice | - Abdulkadiroglu, A., & Sönmez, T. (2003). School choice: A mechanism design approach. The American Economic Review, 93(3), 729-747.  - Abdulkadiroğlu, A., Pathak, P. A., Roth, A. E., & Sönmez, T. (2005). The Boston public school match. American Economic Review, 368-371.  - Pathak, P. A., & Sönmez, T. (2008). Leveling the playing field: Sincere and sophisticated players in the Boston mechanism. The American Economic Review, 98(4), 1636-1652.  - Fragiadakis, D. E., Iwasaki, A., Troyan, P., Ueda, S., & Yokoo, M. (2011). Strategyproof Assignment with Minimum Quotas. (Working paper). |
| 23/5 | The Israeli controlled school choice | - Kesten, O. (2010). School choice with consent. The Quarterly Journal of Economics, 125(3), 1297-1348.  - Abdulkadiroglu, A., Pathak, P., & Roth, A. E. (2009). Strategy-Proofness versus Efficiency in Matching with Indifferences: Redesigning the NYC High School Match. American Economic Review, 99(5), 1954-78.  - Pathak, P. A., & Sethuraman, J. (2011). Lotteries in student assignment: An equivalence result. Theoretical Economics, 6(1), 1-17.  - Erdil, A., & Ergin, H. (2008). What's the matter with tie-breaking? Improving efficiency in school choice. The American Economic Review, 98(3), 669-689.  - Ashlagi, I., Nikzad, A., & Romm, A. I. (2015). Assigning More Students to Their Top Choices: A Tiebreaking Rule Comparison. Available at SSRN 2585367.  - Kesten, O., & Unver, M. U. (2015). A theory of school choice lotteries. Theoretical Economics, 10(2), 543-595. |
| 30/5 | Generalized matching and assignment games | - Roth and Sotomayor, chapters 6-8.  - Kelso Jr, A. S., & Crawford, V. P. (1982). Job matching, coalition formation, and gross substitutes. *Econometrica*, 1483-1504.  - Hatfield, J. W., & Milgrom, P. R. (2005). Matching with contracts. American Economic Review, 913-935.  - Ostrovsky, M. (2008). Stability in supply chain networks. The American Economic Review, 897-923.  - Shapley, L. S., & Shubik, M. (1971). The assignment game I: The core. International Journal of game theory, 1(1), 111-130.  - Hassidim, A., & Romm, A. (2014). An approximate" law of one price" in random assignment games. arXiv preprint:1404.6103. |
| 6/6 | Signaling | - **\* Required \*** Coles, P., Cawley, J., Levine, P. B., Niederle, M., Roth, A. E., & Siegfried, J. J. (2010). The job market for new economists: A market design perspective. The Journal of Economic Perspectives, 24(4), 187-206.  - Coles, P., Kushnir, A., & Niederle, M. (2013). Preference Signaling in Matching Markets. American Economic Journal: Microeconomics, 5(2), 99-134.  - Lee, S., & Niederle, M. (2011). Propose with a rose? signaling in internet dating markets. Experimental Economics, 1-25. |
| 13/6 | Students presentations |  |
| **Note: final paper is due in two weeks!** | | |

**Other courses and relevant websites:**

Alvin Roth's blog on market design ([link](http://marketdesigner.blogspot.co.il/))

Parag Pathak's Market Design class ([Syllabus](http://economics.mit.edu/files/9516))

Scott Kominers' Topics in Matching and Market Design classes ([Winter 2012](http://www.scottkom.com/courses/Topics-in-Matching-and-Market-Design_2011-2012/index.html), [Spring 2013](http://www.scottkom.com/courses/Topics-in-Matching-and-Market-Design_2012-2013/index.html))

Fuhito Kojima's Matching and Market Design ([link](https://sites.google.com/site/fuhitokojimaeconomics/undergradseminar09))