

S190 – Market Design

Format:

This is an 18-hour graduate level optional course offered to all MPhil students. (Conditional on the approval of the graduate studies committee, PhD students can also enrol in this course for credit. If they do so, they will be given additional readings and homework assignments. They will also be assessed separately. See below for more details.)

Course objective:

The course will introduce students to the economics of market design, a field which has enjoyed hugely successful applications of economic analysis and economic engineering. Over the past three decades economic designers took a leading role in reorganising various entry level labour markets (such as those for doctors, teachers, law interns, and more), designing school admissions systems, developing novel package auctions (to allocate wireless/radio/TV spectrum, treasury bonds, fishing rights, airport landing/take-off slots, etc.), and introducing organ transplant clearinghouses that enable exchange of donors. The rise of online economic transactions vastly expanded the scope of economic design and specifically the design of marketplaces to include applications to keyword auctions (as in Google search ads), online auctions (eBay, and beyond), dating platforms, and more.

The course content is very much motivated by real life applications and specific case studies. Beginning from a broad and high-level understanding of what makes a marketplace successful in practice, we will cover a wide range of examples (some of which are listed above) to illustrate how the specific context of a particular economic transaction determines the key ingredients of a marketplace that can govern those transactions. We will carefully describe the backbone designs involved in these applications. We will either derive their key properties (when the arguments are not too complicated) or provide intuitive explanations as to what aspects of the specific design address the desiderata of a successful marketplace.

By the end of the course, the students should have developed a feel for the scope of market design so they can recognise real life problems which can benefit from careful economic design, identify the issues that need addressing, and have the skills to apply the lessons learnt to inform better design.

Who this course is for:

All MPhil and PhD students are eligible to take the course. If the student is enrolled in the PhD programme, however, he/she needs the approval of the graduate studies committee, will be required to do additional reading and coursework, and will be assessed with a different exam.

Despite being recognised both in public/political sphere (as evidenced by widespread adoption of new economic designs) and in academic economics (e.g., the Nobel Prizes to Roth and Shapley in 2012, and to Milgrom and Wilson in 2020), our Faculty has not covered any of these developments in our graduate coursework with a few exceptions in specialised short PhD modules (back in 2012-2015). The course aims to meet strong student demand to learn the developments in market design with a view towards gaining insights for practical purposes (in both public policy and private industry) as well as reaching the research frontier of this highly active field.

Assessment:

Students will be assessed based on a combination of a 2-hour exam and a short project with a word limit of 4,000 words. (PhD students will be assessed separately with more demanding criteria in both the project and the exam.)

Tentative reading list:

Books:

- Guillaume Haeringer, *Market Design: Auctions and Matching*, MIT Press.
- Alvin Roth & Marilda Sotomayor, *Two-sided matching*, Cambridge University Press.
- Paul Klemperer, *Auctions: Theory and Practice*, Princeton University Press.

Expository and Survey Articles:

- Atila Abdulkadiroglu and Tayfun Sonmez: "Matching Markets: Theory and Practice," in *Advances in Economics and Econometrics: Tenth World Congress, 2013*, Cambridge University Press (Edited by Daron Acemoglu, Manuel Arellano, Eddie Dekel)
- Muriel Niederle, Alvin E. Roth and Tayfun Sonmez: "Matching and Market Design," in *New Palgrave Dictionary of Economics, Second Edition, 2008* (Edited by Steven N. Durlauf and Lawrence E. Blume)
- Alvin Roth (2002): "The economist as engineer: Game theory, experimentation, and computation as tools for design economics," *Econometrica*, 70, 1341-1378.
- Alvin Roth (2008). "Deferred acceptance algorithms: history, theory, practice, and open questions," *Int J Game Theory*, 36:537-569.
- Alvin Roth (2008): "What Have We Learned from Market Design?," *Economic Journal*, vol. 118(527), 285-310.
- Tayfun Sonmez and Utku Unver (2011): "Matching, Allocation, and Exchange of Discrete Resources," *Handbook of Social Economics Vol.1A*. 781-852.

Research Articles (mostly for PhD students and those students aiming to write a dissertation in this field):

- A. Roth & A. Ockenfels (2002), "Last-Minute Bidding and the Rules for Ending Second-Price Auctions: Evidence from eBay and Amazon Auctions on the Internet," *American Economic Review*, P&P, Vol. 92, pp. 1093-1103.
- B. Edelman, M. Ostrovsky & M. Schwarz (2007), "Internet advertising and the generalized second-price auction: Selling billions of dollars worth of keywords," *American Economic Review*, Vol. 97, pp. 242-259.
- P. Cramton (2006), "Simultaneous Ascending Auctions," in P. Cramton, Y. Shoham, and R. Steinberg (eds.), *Combinatorial Auctions*, Chapter 4, pp. 99-114, MIT Pr
- D. Gale & L. Shapley (1962), "College Admissions and the Stability of Marriage," *American Mathematical Monthly*. Vol. 69, pp. 9-15.
- A. Roth (1991), "A Natural Experiment in the Organization of Entry-Level Labor Markets: Regional Markets for New Physicians and Surgeons in the United Kingdom," *American Economic Review*, Vol. 81, pp. 415-450.
- J. Kagel & A. Roth (2000), "The Dynamics of Reorganization in Matching Markets: A Laboratory Experiment Motivated by a Natural Experiment," *Quarterly Journal of Economics*, Vol. 115, pp. 201-235.
- A. Roth & E. Peranson (1999), "The redesign of the matching market for American physicians: Some engineering aspects of economic design," *American Economic Review*, Vol. 89, pp. 748-780.
- A. Abdulkadiroglu & T. Sonmez (1998), "House Allocation with Existing Tenants," *Journal of Economic Theory*, Vo. 88, pp. 233-260.
- A. Abdulkadiroglu & T. Sonmez (2003), "School Choice: A Mechanism Design Approach,"

American Economic Review, Vo. 93, pp. 729-747.

- A. Erdil & H. Ergin (2008) “What's the Matter with Tie-Breaking? Improving Efficiency in School Choice,” American Economic Review, Vol. 98, pp. 669-689.
- A. Roth, T. Sonmez & M. Utku Unver (2003), “Kidney Exchange,” Quarterly Journal of Economics, Vo. 119, pp. 457-488.

Tentative course outline:

Lecture 1: Why market design?

Lecture 2: Simple auctions

Lecture 3: Online auctions (eBay and beyond)

Lecture 4: Package auctions

Lecture 5: Keyword auctions

Lecture 6: Spectrum auctions

Lectures 7-8: Auctions in financial markets

Lecture 9: Further examples of auctions in practice (electricity markets, commons management, etc.)

Lecture 10-11: The basic model of two-sided matching, properties of stable matchings

Lecture 12: The medical match

Lecture 13: Further developments in centralised labour markets

Lectures 14-15: School admissions

Lecture 16: Assignment markets

Lecture 17: Kidney exchange

Lecture 18: New applications ahead