

# Advanced Economic Theory: Mechanism and Market Design\*

## Objectives

This course gives an introduction to the theory of mechanism and market design and some of its key-applications. The main theoretical building blocks are the theory of social choice, incentives, implementation, and matching that will be addressed throughout the first week of the course. The theoretical insights will be applied to the design of (entry-level) labor markets, exchange platforms for student housing or organ-transplants, and the allocation of infrastructure throughout the second week of the course.

## Evaluation

**Take-home exam** Throughout the first week of the course, students will receive little problem sets that have to be submitted before the beginning of the second week of the course and are subject to grading.

**Research paper** After the course, students have to prepare a short paper (6 to 10 pages) of a market or mechanism design problem of their own choice. The paper can apply the insights of the course to another area of market design, discuss the extension of a theoretical result, or discuss a related research direction which has not been covered in class (for inspiration, see the webpage of Al Roth at Harvard (soon Stanford) - in particular the material of his course on market design and the “market design blog” will prove useful). The paper can either be an original piece of research or mainly a well-structured review of one or more paper(s) by other researcher(s). A topic related to the students PhD project is certainly welcome. The paper should be typed (handwriting is not accepted). Joined work of up to two students is encouraged, but in that case the paper should be 10-14 pages (and the grade will not discriminate between the two students). The final grade will be one third the grade of the take-home exam and two thirds the grade for the research paper.

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## Core texts

Key elements of social choice and mechanism design are covered in ch. 21 and 23 of

Mas-Colell et al. (MWG), *Microeconomic Theory*, Oxford University Press, 1995.

However, you may prefer to read Reny (2001) and Krishna and Perry (1998) instead. A comprehensive reference for the basics on two-sided matching is

Roth, A.E. and M. Sotomayor (RS), *Two-Sided Matching: A Study in Game-Theoretic Modeling and Analysis*, Econometric Society Monograph Series, Cambridge University Press, 1990.

The more recent literature on normative allocation design is reviewed in

Sonmez, T. and U. Unver (SU), *Matching, Allocation, and Exchange of Discrete Resources*, forthcoming *Handbook of Social Economics*, 2009, forthcoming *Handbook of Social Economics*.

A detailed introduction to the theory of (package) auctions and the application to spectrum market design is given by

Milgrom, P., *Putting Auction Theory to Work*, Cambridge University Press, 2004.

## Research papers

Abdulkadiroglu, Atila and Tayfun Sonmez (1999), *House Allocation with Existing Tenants*, *Journal of Economic Theory*, LXXXVIII, 233-260.

Abdulkadiroglu, Atila, and Tayfun Sonmez (2003), *School Choice: A Mechanism Design Approach*, *American Economic Review*, 93-3: 729-747.

Abdulkadiroglu, Atila, Parag A. Pathak, and Alvin E. Roth (2009), *Strategy-proofness versus Efficiency in Matching with Indifferences: Redesigning the NYC High School Match*, *American Economic Review*, 99(5): 1954-1978.

Ausubel, Larry and Paul Milgrom (2002), *Ascending Auctions with Package Bidding*, *Frontiers of Theoretical Economics*, 1(1).

Gale, David and Lloyd Shapley (1962), *College Admissions and the Stability of Marriage*, *American Mathematical Monthly*, 69, 9-15.

Hatfield, John William and Milgrom, Paul R. (2005), *Matching with Contracts*, *The American Economic Review*, Volume 95, Number 4, pp. 913-935.

Krishna, Vijay and Motty Perry (1998), *Efficient Mechanism Design*, mimeo.

Reny, Phil (2001), Arrows theorem and the Gibbard-Satterthwaite theorem: a unified approach, *Economics Letters* 70, 99105.

Roth, Alvin E. and Elliott Peranson (1999), The Redesign of the Matching Market for American Physicians: Some Engineering Aspects of Economic Design, *American Economic Review*, 89, 4, 748-780.

Roth, Alvin E. (1984), The Evolution of the Labor Market for Medical Interns and Residents: A Case Study in Game Theory, *Journal of Political Economy*, 92, 991-1016.

Roth, Alvin E. (2002) The Economist as Engineer: Game Theory, Experimental Economics and Computation as Tools of Design Economics, *Econometrica*, 70, 4, 1341-1378.

Roth, Alvin E., Tayfun Sonmez, and M. Utku Unver (2004), Kidney Exchange, *Quarterly Journal of Economics*, 119, 2, 457-488.

Roth, Alvin E. (2008a), What have we learned from market design? Hahn Lecture, *Economic Journal*, 118, 285-310.

Roth, Alvin E. (2008b), Deferred Acceptance Algorithms: History, Theory, Practice, and Open Questions, *International Journal of Game Theory*, Special Issue in Honor of David Gale on his 85th birthday, 36, 537-569.

Shapley, Lloyd, and Herbert Scarf (1974), On Cores and Indivisibility, *Journal of Mathematical Economics*, 2328.

## Schedule

All sessions are 9-12 in “Besprechungsraum FiWi” (SOWI), IBK.

### Week 1: Theory

- Session 1: 26-11-2012: Opening and introductory examples  
Roth (2002), Roth (2008a), MWG (1995, ch. 21)
- Session 2: 27-11-2012: Elements of social choice (Arrow impossibility, Gibbard-Satterthwaite theorem)  
MWG (1995, ch. 21), Reny (2001)
- Session 3: 28-11-12: Optimal mechanism design (implementation, revelation principle, revenue equivalence theorem)  
MWG (1995, ch. 23), Krishna and Perry (1998)
- Session 4 and 5: 29/30-11-2012: Two-sided matching (stability, manipulability, and fairness)  
RS (1990, ch. 2-4), Gale and Shapley (1962)

### Week 2: Applications

- Session 6: 10-12-2012: Entry-level labor markets  
Roth (1984), Roth and Peranson (1999)
- Session 7: 11-12-2012: Student Housing  
SU (2009, ch. 2), Shapley and Scarf (1974), Abdulkadiroglu and Sonmez (1999)
- Session 8: 12-12-2012: Kidney exchange  
SU (2009, ch. 3), Roth et al. (2004)
- Session 9: 13-12-2012: School choice and student placement  
SU (2009, ch. 4), Abdulkadiroglu and Sonmez (2003), Abdulkadiroglu et al. (2009)
- Session 10: 14-12-2012: Matching with contracts and package auctions  
Hatfield and Milgrom (2005), Ausubel and Milgrom (2002), Milgrom (2004, ch. 7-8)