
Microeconomics V

Market and Mechanism Design

Module 5, 2022-23

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Overview

This is a master level course that provides students with the main concepts and techniques in the topics of matching markets, mechanism design, and auction theory. In the first part, we study markets where there is no money and no prices. Instead, we have people preferences over possible matching and allocation outcomes. Examples include placing doctors in residency positions, assigning students to schools, and assigning kidneys to transplant patients. We will learn algorithms that have desirable theoretical properties and are often used in practice. In the second part, we consider the problem of designing mechanisms that involves monetary transactions. Examples include the problem of allocating public goods, auctions to sell treasury bills, auctions used by Google, Microsoft and Facebook to sell advertising, and the auctions used by governments to sell radio spectrum licenses.

Information

The table below presents information about the class location, office hours, and contact information. If you have a question or a problem, you can expect me to respond within 24 hours (within 48 hours during weekends and holidays).

Class	TBA	TBA
Office Hours	TBA	TBA
Email	akushnir@andrew.cmu.edu	Checking daily
Website	@my.nes	

Class materials, assignments, solutions, and announcements will be posted on [@my.nes](https://my.nes).

Evaluation

The final grade for this class is computed as follows:

Homeworks	40%
Final Exam	60%

Homeworks

There will be **4 homeworks**. The due times are listed in Course Outline and Schedule. You will have approximately one week to complete each assignment. Submit homeworks in electronic format through email or [@my.nes](https://my.nes). Only **3 out of 4 homeworks** count towards final grade.

Course Materials

The following books are highly recommended.

For matching theory:

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

For mechanism design:

- Milgrom, P. (2004). *Putting Auction Theory to Work*, Cambridge University Press.
- Vijay Krishna (2002). *Auction Theory*, Elsevier, 2002.

Course Outline and Schedule (preliminary and subject to change)			
#	Date	Class topic	Case studies, readings, and assignments ¹
1		Introduction	Reference: Roth, A. E. (2018). Marketplaces, Markets, and Market design. <i>American Economic Review</i> , 108, 1609-1658.
2		Feeding America and National Residency Match Program	<p>Case study: Prendergast, C. (2017). How food banks use markets to feed the poor. <i>Journal of Economic Perspectives</i>, 31(4), 145-62.</p> <p>Case study: Robinson, S. (2003). Are medical students meeting their (best possible) match? <i>SIAM News</i>, 36(3), 8-9.</p> <p>Reference: Roth, A. (2008) Deferred acceptance algorithms: History, theory, practice, and open questions. <i>Int. Journal of Game Theory</i>.</p> <p>Alvin E. Roth. The evolution of the labor market for medical interns and residents: A case study in game theory. <i>Journal of Political Economy</i>, 92:991, 1016, 1984.</p> <p>Roth, A. E., & Peranson, E. (1999). The redesign of the matching market for American physicians: Some engineering aspects of economic design. <i>American economic review</i>, 89(4), 748-780.</p>
3		Introduction to matching	Reference: Gale, D., & Shapley, L. (1962). College admissions and the stability of marriage. <i>The American Mathematical Monthly</i> , 69(1), 9-15.
4		Introduction to matching continued	Reference: Gale, D., & Shapley, L. (1962). College admissions and the stability of marriage. <i>The American Mathematical Monthly</i> , 69(1), 9-15. HW1 is due
5		School Choice	<p>Case studies:</p> <p>a) Abdulkadiroğlu, A., Pathak, P. A., Roth, A. E., & Sönmez, T. (2005). The Boston public school match. <i>Am. Econ. Review</i>, 95(2), 368-371.</p> <p>b) Abdulkadiroğlu, A., Pathak, P. A., & Roth, A. E. (2005). The New York city high school match. <i>American Economic Review</i>, 95(2), 364-367.</p> <p>Reference: Abdulkadiroğlu, A., Agarwal, N., & Pathak, P. A. (2017). The welfare effects of coordinated assignment: Evidence from the New York City high school match. <i>American Economic Review</i>, 107(12), 3635-89.</p>
6		Many-to-one	Boston mechanism

		matching theory	
7		Kidney exchange	<p>Case study: “Kidney Exchange: A Life-Saving Application of Matching Theory,” National Science Foundation.</p> <p>Reference: Sönmez, T., Ünver, M. U., & Yenmez, M. B. (2020). Incentivized kidney exchange, <i>Am. Econ. Review</i>, 110(7), 2198-2224.</p>
8		Kidney exchange	<p>Kidney exchange, top trading cycle, and house allocation problem</p> <p>HW2 is due</p>
9		Course allocation	<p>Reference: Budish, E., Cachon, G. P., Kessler, J. B., & Othman, A. (2017). Course match: A large-scale implementation of approximate competitive equilibrium from equal incomes for combinatorial allocation. <i>Operations Research</i>, 65(2), 314-336.</p>
10		Allocation airport slots	<p>Reference: Schummer, J., & Vohra, R. V. (2013). Assignment of arrival slots. <i>American Econ. Journal: Microeconomics</i>, 5(2), 164-85.</p>
11		Introduction to auctions and mechanism design	<p>Case study: National Academy of Sciences Beyond Discovery Report “The Bidding Game,” March 2003.</p> <p>Reference: Klemperer, P. (2002). What really matters in auction design. <i>Journal of Economic Perspectives</i>, 16(1), 169-189.</p> <p>Reference: Varian, H. R. (2007). Position auctions. <i>International Journal of industrial Organization</i>, 25(6), 1163-1178.</p> <p>Edelman, B., Ostrovsky, M., and Schwarz, M. Internet advertising and the generalized second-price auction: Selling billions of dollars’ worth of keywords. <i>American Economic Review</i>, 97, 2007.</p> <p>HW3 is due</p>
12		Envelope theorem and characterization of incentive compatibility	<p>Milgrom, P., & Segal, I. (2002). Envelope theorems for arbitrary choice sets. <i>Econometrica</i>, 70(2), 583-601.</p> <p>Mookherjee, D., & Reichelstein, S. (1992). Dominant strategy implementation of Bayesian incentive compatible allocation rules. <i>Journal of Economic Theory</i>, 56(2), 378-399</p> <p>Milgrom (2004) pp. 64-72,80-83, 98-106</p>
13		Bayesian implementation	<p>Milgrom (2004) pp. 73-80, 83-96</p>
14		Revenue-maximizing auctions	<p>Krishna (2010) pp. 61-75; Milgrom (2004) pp. 110 -155</p> <p>HW4 is due</p>