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Location: CLUB 4
Meeting Times: TTH 9:30-10:45
Office Hours: TTH 12:00 – 1:30
(or by appointment)

Course website:

All course materials will be posted on [Desire2Learn \(D2L\)](https://desire2learn.com) website that can be accessed at <https://learn.colorado.edu>.

Course Description:

Economists are increasingly involved not just in studying but in designing practical market mechanisms. These include auctions to sell diamonds, timber, electricity, procurement contracts and radio spectrum; matching algorithms to assign students to schools, or candidates to jobs; as well as marketplaces and mechanisms to sell internet advertising, trade financial securities, or reward innovation. The field of market design studies how to construct rules for allocating resources or to structure successful marketplaces. It draws on the tools of game theory and mechanism design to identify why certain market rules or institutions succeed and why others fail.

The course consists of four parts. In the first part, we review the fundamental concepts from the game theory and develop strategic thinking. In the second part, we look at the “matching markets” that operate without prices, highly unusual for economics. Examples include assigning students to schools, assigning donor kidneys to transplant patients and college admissions. The third part of the class is on auctions and good auction design. Examples range from simple auctions used by eBay and Christie’s to auctions used in financial markets, auctions used by Google, Facebook and Microsoft to sell advertising, and auctions used by government to sell large-scale complex assets such as radio spectrum. Finally, we consider a problem of designing and regulating market “platforms”. Examples include ecommerce platforms (such as Amazon and eBay) and peer-to-peer online markets.

Textbook:

There is no required textbook for this class. Appropriate readings will be indicated during lectures and available on the class website. Outlines of lecture notes will also be provided on the class website.

The readings are mostly economics journal articles, or popular press articles, that provide some context for the class. All of the listed papers (at least large parts of them) should be readable.

A book "*Thinking Strategically*" by Avinash Dixit and Barry Nalebuff is a very famous book suitable for the Game Theory part of the class.

A book "*Who Gets What — and Why: The New Economics of Matchmaking and Market Design*" by Alvin E. Roth is an easy read suitable for the Matching part of the class.

Prerequisites:

The course is available to students who have completed ECON 3070 Intermediate Microeconomic Theory.

Required Level of Mathematics:

The class does not require knowledge of mathematical concepts beyond the ones covered in ECON 1088. At the same time, the course includes a good deal of economic theory and extensive strategic arguments. Students should expect theoretical arguments in every class.

Assessment:

There will be two midterm exams, a final exam, periodic problem sets and an optional project.

1. Problem sets (20%)
2. Midterm exams (25% each)
4. Final Exam (30%)
3. (Optional) Project with an "in class" presentation

A student can miss two classes without excuse. After that, any unauthorized missed classes will be reflected in the course grade. There will be no make up exams. A student who misses a midterm due to an excused absence will have the additional weight shifted to the final.

Feel free to form study groups to review and discuss lecture/reading materials, and homework assignments but you must submit individual work for grading (Note: if you work on assignments as part of a study group, please list the names of all members on the front page of your submitted assignment).

Tentative Course Outline:

1. Game Theory (weeks 1-5)
2. **Midterm 1 (in class, Feb 11th)**
3. Matching (weeks 6 - 10)
4. **Midterm 2 (in class, Mar 17th)**
5. Spring Break (week 11)
6. Auctions (weeks 12- 14)
7. Platforms (weeks 14-16, if time permits)
8. **Final Exam (May 2nd, 4:30 pm)**

Detailed Course Outline with topics:

1. Overview of the class

Topics: syllabus, overview of the content, introduction into game theory and market design

Game Theory:

2. Static Games

Topics: static games, dominant strategies, Nash Equilibrium

3. Dynamic Games

Topics: dynamic games, subgame perfect equilibrium and backward induction

4. Incomplete Information

Topics: simple games with incomplete information, concept of Bayesian Nash equilibrium, simple auction games

Matching:

5. Introduction to Matching Markets

Topics: “marriage market” and one-to-one matching, stable matches, the Deferred Acceptance algorithm, existence result, optimal matches for both sides of the market, incentives of participants, “roommate problem”, nonexistence result, redefinition of the stability for the “roommate problem” and existence result.

Readings:

“College Admissions and the Stability of Marriage” by David Gale and Lloyd Shapley (1962)

6. Stable Matching and Orderly Markets

Topics: stable matchings and orderly markets, the problem of market unravelling, case study: medical residents and the NRMP, medical fellowships, law clerks, college admission

Readings:

“What Have We Learned from Market Design” by Alvin Roth (2008)

“The Re-Design of the Matching Market for American Physicians: Some Engineering Aspects of Economic Design” by Alvin Roth and Elliott Peranson (1999)

7. House Allocation and Kidney Exchange

Topics: the House Allocation Problem, efficient outcomes and the core, serial dictatorship, the top trading cycles algorithm and its variations, kidney exchanges

Readings:

"A Kidney Exchange Clearinghouse in New England" by Alvin Roth, Tayfun Sonmez and Utku Unver (2005)

“Kidney Exchange: A Life-Saving Application of Matching Theory” (2005)

8. School Choice

Topics: School Choice Problem, the Boston algorithm and its incentives, deferred acceptance and top trading cycles as alternatives, problem of ties, case studies: NYC and Boston

Readings:

“The New York City High School Match” by Atila Abdulkadiroğlu, Parag Pathak and Alvin Roth (2005)

“The Boston Public School Match” by Atila Abdulkadiroğlu, Parag Pathak, Alvin Roth and Tayfun Sonmez (2005)

“School Choice” by Joseph Malkevitch

Auctions:

9. Introduction to Auction Theory

Topics: private value model, first and second price sealed bid auctions, all pay auctions, ascending auctions, the revenue equivalence theorem, eBay auctions - equivalence and nonequivalence to the second-price auction

Readings:

“The Bidding Game” National Academy of Sciences Beyond Discovery Report (2003)

10. Designing Good Auctions

Topics: how to design an auction, facilitating entry, reserve prices, bidder subsidies, collusive bidding, optimal auction design

Readings:

“What Really Matters in Auction Design” by Paul Klemperer (2002)

11. Penny Auctions (???)

Topics: case study: QuiBids, LazyBids

Readings: TBA

12. Common Value Auctions

Topics: common value model, the winner’s curse, examples and applications, aggregation of information, application to oil lease auctions

Readings:

“An Empirical Study of an Auction with Asymmetric Information” by Ken Hendricks and Robert Porter (1988)

“Anomalies: The Winner’s Curse” by Richard Thaler (1988)

13. Financial Markets and High-Frequency Trading

Topics: electronic markets for trading equity and other financial securities, the use of auctions for IPOs, real-time trading and market clearing, competition between exchanges

Readings:

“Concept Release on Market Structure” by SEC (2010)

“The High-Frequency Trading Arms Race: Frequent Batch Auctions as a Market Design Response” by Eric Budish, Peter Cramton and John Shim

14. Multi-Unit Auctions

Topics: multi-unit auctions, uniform price, pay-as-bid price (discriminatory), demand reduction, Vickrey pricing and efficient auction design, case study: treasury auctions

Readings: TBA

15. Sponsored Search Auctions

Topics: the sponsored search market, Google’s advertising auction, bidding incentives and equilibria, other ways to run the auction, Facebook’s Vickrey auction, optimal design in search auctions (Yahoo case study)

Readings:

“The Economics of Internet Search” by Hal Varian (2007)

“Online Advertising: Heterogeneity and Conflation in Market Design” by Jonathan Levin and Paul Milgrom (2010)

16. Large-Scale Auctions for Radio Spectrum

Topics: auctions to award property rights for radio spectrum, design of FCC auctions, evidence from US and Europe

Readings:

"Winning Play in Spectrum Auctions" by Jeremy Bulow, Jonathan Levin and Paul Milgrom

"The Biggest Auction Ever: The Sale of the British 3G Telecom Licenses" by Ken Binmore and Paul Klemperer

17. Combinatorial Auctions

Topics: complementarities, auction design issues, winner determination problem, pricing rules, case studies: airport slot auction FAA, truckload auctions.

Readings:

"Spectrum Auction Design" by Peter Cramton

Platforms: (if time permits)

18. Introduction to the Economics of Platforms

Topics: designing platforms for exchange, network effects, optimal pricing by the platform owner, competition between platforms for users, market tipping

Readings:

"The Economics of Internet Markets" by Jonathan Levin

"The Industrial Organization of Markets with Two-Sided Platforms" by David Evans and Richard Schmalensee

"The Singularity is Not Near: Slowing Growth of Wikipedia" by Suh et al.

19. Internet Commerce Markets

Topics: creating internet markets for e-commerce, eBay and internet auctions, reputation systems, Amazon and internet retail, search and sales mechanisms

Readings:

“Sales Mechanisms in Online Markets: What Happened to Internet Auctions?” by Liran Einav, Chiara Farronato, Jonathan Levin and Neel Sundaresan

“Engineering Trust: Strategic Behavior and the Production of Reputation Information” by Gary Bolton, Ben Greiner and Axel Ockenfels

20. Peer-to-Peer Online Markets

Topics: creating peer-to-peer markets: online labor markets, Airbnb, Uber, etc.

Readings: TBA

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