1 Course Description and Objectives

There is a myriad of market mechanisms to allocate resources that can be classified as auctions. These are currently used in various markets ranging from art objects to fresh fish, from electricity to treasury bonds, from government procurement to internet ads.

This course has three main objectives. First, students will learn how these various market mechanisms work. We will discuss the theoretical foundations behind them as well as explore many real-world applications. We will use game theory to analyze bidders’ strategic interaction and characterize their behavior. Second, students will learn how the market rules can be modified to attain specific objectives and to derive policy recommendations. Finally, students will learn the recent empirical methods to analyze auction data needed to conduct research in auctions.

This class is designed for students with a strong quantitative background. Since the work of Vickrey (1961), we can think of auctions as an application of games of incomplete information and, thus, this class is a complement to Game Theory. I will not assume any knowledge of Game Theory and will spend the first part of this course introducing all the necessary concepts of Game Theory. Even though we will discuss many real-world applications, you can expect this class to be on the theoretical side.

After the introduction to Game Theory, we will examine the theoretical models behind the most commonly used auction formats: English, Dutch, first- and second-price. Students will learn the core theoretical results and will be exposed to recent empirical research in auctions. We will then spend some time discussing topics in auction design. Next, students will be introduced to the state-of-the-art empirical approaches to analyze auction data. Finally, we will discuss more advanced topics including multi-unit and internet auctions.
2 Administrative Info

- The class meets on Tue and Thu 3:30PM-5:00PM in BRB 2.136. The lectures will be recorded and they will be available on Canvas to students taking the course online.

- Contact information
  
  email: jbalat@utexas.edu
  
  Office Hours: My regular office hours are on Thursdays from 9 to 11 am (CT) and they will take place via Zoom:
  
  https://utexas.zoom.us/j/155701757

- Teaching assistant: Yumin Hong
  
  email: ymhong@utexas.edu
  
  Office Hours: TBD

- It is your responsibility to frequently check the course webpage on Canvas for announcements, assignments, and other material.

- Any part of this syllabus is subject to change

3 Requirements

*Class Participation and Readings (10%)* Active student participation is essential to a successful learning environment. Students are expected to complete the reading assignments before each class and participate in the discussions. I will ask questions and encourage you to ask questions as well. There will be short quizzes for some of the assigned readings.

*Problem Sets (20%)* There will be regular problem sets, assigned during the semester. The problem sets are designed to give the students an opportunity to review and enhance the material learned in class. Problem sets will be posted on the course web page and will be administered via Gradescope. You are responsible for checking the website and downloading the questions. *Late submissions are not accepted*

Students are encouraged to form small study groups. At the stage when you are figuring out how to do a homework problem, you are welcome to discuss with others how to set up the problem, and the strategy for solving it. Once you’ve solved the problem, you are welcome to compare your answer with those of others, and to discuss the sources of any differences between your answers. However, each student is expected to write up their own answers independently. If your answer(s) and those of another student are identical or too similar, this may be taken as evidence that you have not written up your answers independently. Should “copying” occur, both the student who copied work from another student and the student who gave material to
be copied will receive a zero for the entire homework assignment, and failure of the course and University disciplinary action may be involved. Permissible collaboration should never involve one student having possession of another student’s answers.

Midterms (50%) There will be two in-class midterm.

Final Project (20%) Each student will be required to write a short paper. More details TBA.

Your weighted average course score will be computed from your scores on these components, and a grade will be assigned based on your score relative to the distribution of scores in the class. This approach allows me to assign letter grades without an absolute scale, and to adjust the percentages of the class receiving different letter grades (within limits). The percentage of students receiving any particular letter grade is not predetermined. It is possible for all students to get a C or above, and for the large majority to receive an A or a B. However, lower grades will be assigned to students who do not demonstrate proficiency or mastery of the material. Pluses and minuses will be used.

4 Student Accommodations

Students with a documented disability have the right to request appropriate academic accommodations from the Division of Diversity and Community Engagement, Services for Students with Disabilities, 512-471-6259 (voice) or 1-866-329-3986 (video phone).
http://ddce.utexas.edu/disability/about/

- Please request a meeting as soon as possible to discuss any accommodations
- Please notify me as soon as possible if the material being presented in class is not accessible
- Please notify me if any of the physical space is difficult for you

5 Academic Integrity

The strength of the university depends on academic and personal integrity. Each student in the course is expected to abide by the University of Texas Honor Code:

As a student of The University of Texas at Austin, I shall abide by the core values of the University and uphold academic integrity.

This means that work you produce on assignments, tests and exams is all your own work, unless it is assigned as group work. I will make it clear for each test, exam or assignment whether collaboration is encouraged or not.
Always cite your sources. If you use words or ideas that are not your own (or that you have used in previous class), you must make that clear otherwise you will be guilty of plagiarism and subject to academic disciplinary action, including failure of the course. You are responsible for understanding UT’s Academic Honesty Policy which can be found at the following web address:

http://deanofstudents.utexas.edu/sjs/acint_student.php

5.1 Sharing of Course Materials is Prohibited

No materials used in this class, including, but not limited to, lecture hand-outs, videos, assessments (quizzes, exams, papers, projects, homework assignments), in-class materials, review sheets, and additional problem sets, may be shared online or with anyone outside of the class unless you have my explicit, written permission. Unauthorized sharing of materials promotes cheating. It is a violation of the University’s Student Honor Code and an act of academic dishonesty. I am well aware of the sites used for sharing materials, and any materials found online that are associated with you, or any suspected unauthorized sharing of materials, will be reported to Student Conduct and Academic Integrity in the Office of the Dean of Students. These reports can result in sanctions, including failure in the course.

6 Textbooks

The course will mostly use academic papers and class notes. Here is a list of books that are highly recommended (but not required) to supplement assigned readings and/or your research:

- Introduction to Auctions
    
    This book is a concise and comprehensive guide to the economic analysis of auctions, and I highly recommend it. It does not include a formal mathematical treatment of the different topics but it is a great source for the intuition behind each topic.

- Auction Theory
    
    UT-Austin has rights to the online version:


It’s free online:
http://www.nuff.ox.ac.uk/users/klemperer/VirtualBook/VBCrevisedv2.asp


UT-Austin has rights to the online version:

Empirical Analysis of Auction Data


Game Theory


7 Course Outline

This outline is tentative and, if time permits, we will be able to cover all topics in the order that follows.

Readings marked with an asterisk (*) are required. (HP) refers to *Introduction to Auctions* by Hubbard and Paarsch, 2015. (K) refers to *Auction Theory* by Krishna, 2010. (T) refers to *Game Theory: An Introduction* by Tadelis, 2013.

1. Introduction

Readings:  (HP) Chapter 1
(K) Chapter 1
2. (An Introduction to) Game Theory

2.1 Games of Complete Information

Topics: Normal-form representation of games; Iterated elimination of strictly dominated strategies; Nash Equilibrium; Examples; Mixed strategies; Existence of Nash Equilibrium

Readings: (HP) Chapter 2
(T) Chapter 3, 4, 5, 6


2.2 Games of Incomplete Information

Topics: Normal-form representation of games of Bayesian games; Bayesian Nash Equilibrium; Examples

Readings: (HP) Chapter 2
(T) Chapter 12 & 13

3. Auction Theory and Applications


3.1 Private Value Auctions

Topics: The private value model of auctions; Ascending auctions; First- and second-price sealed bid auctions; Dutch auctions; All-pay auctions

Readings: (HP) Chapter 3
(K) Chapter 2

3.1.1 The Revenue Equivalence Theorem

Readings: (HP) Chapter 3
3.1.2 Extensions

Topics: Asymmetries; Affiliation; Risk averse bidders

Readings: (HP) Chapter 4
(K) Chapter 4


Matthews (1987), “Comparing auctions for risk averse buyers a buyer’s point of view”, *Econometrica*


3.2 Auction Design

Topics: Optimal reserve price; Encouraging participation; Bid preference programs

Readings: (HP) Chapter 4
(K) Chapter 2 & 4


3.3 Common Value Auctions

Topics: The common value model of auctions; The winner’s curse; Examples and applications; When do prices aggregate information; Application to oil lease auctions

Readings: (HP) Chapter 4
(K) Chapters 6 & 7

4. Empirical Analysis of Auction Data

Topics: Nonparametric density estimators; Structural estimation


Campo, Perrigne, and Vuong (2003), “Asymmetry in First-Price Auctions with Affiliated Private Values”, *The Journal of Applied Econometrics*

5. Other Topics

5.1 Collusion

*Topics:* Bid rigging and collusion; Theory and empirical applications

*Readings:* (HP) Chapter 5
(K) Chapter 11


5.2 Multi-Unit Auctions

*Topics:* Multi-Unit auctions; Uniform price auctions; Discriminatory price auctions; Demand reduction; Vickrey pricing; Sequential auctions; Examples and applications; Efficient auction design

*Readings:* (HP) Chapter 7
(K) Chapters 12 & 13


### 5.3 Internet Auctions

**Topics:**  eBay Auctions; Sponsored Search Auctions; Google’s advertising auction

**Readings:**  (HP) Chapter 6 & 8  
(K) Chapter 17


(*) Bajari and Hortacsu (2004), “Economic Insights from Internet Auctions”, *Journal of Economic Literature*


(*) *The Economist*, Aug 29th 2015, “Economists may idolise auctions, but most people do not”

