

Econ 4020: Auction Theory and Practice  
Fall, 2019

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## COURSE OUTLINE

### Opening Remark

This is an incomplete draft of the syllabus. I will update it as we go on so keep an eye on this document. Meanwhile, read this entire course outline carefully! (This document consists of 4 pages.) Any items, rules, requirements in this course outline may be subject to changes. When this happens I will announce it during the lecture. Announcements in the class and through the Collab website supersede any information contained in this course outline.

### Course Description

Auction Theory and Practice has two broad parts: theory and empirical (practice). The main goal of this class is to introduce you to the theory of auction design, and teach you how to analyze real auction data to answer some important questions.

Auction is and an ancient method used to buy and sell both goods and services. Consider an individual who wants to sell her used car. How should she sell? Should she bargain with potential buyers, or should she post a take-it-or-leave-it price? Or should she use auction? In the span of this course we will show that using auction is (in all likelihood) the best the seller can do. But should the seller set a minimum price below which she commits not to sell? If so, what should this minimum price be? There are different kinds of auction formats, e.g. first-price auction where the winner pays her bid and the second-price auction where the winner pays the second-highest bid. So what kind of auction format should the seller choose? It turns out in many relevant cases it does not matter - both lead to the same (expected) revenue for the seller. Now turn the table and consider a potential buyer who goes to online auction sites such as eBay cars to buy a second hand car. She can see a few active bidders who are also interested in the same car. What should she bid? How does her bid change with the number of competitors?

So even when the seller does not know how much each buyer is willing to pay for the product/service the seller can guarantee good revenue by exploiting the competition among the buyers. Auction is also used in procurement, where a buyer, usually a government agent solicits bids from sellers who are willing to sell the product or provide the service. For example, consider the state of Virginia who wants to construct and maintain highways and solicits bids from many construction companies. What should be the auction rules that guarantee that VA selects the most efficient construction company? Now suppose the state also wants to guarantee a minimum quality of the roads. Presumably high quality roads cost more, *ceteris paribus*. How should the auction rules change to reflect this dual objective? Competition among bidders, which is the key in a well designed auction rule, can be rendered ineffective if the bidders come together and collude. Collusion often leads to higher cost of procurement and inefficient outcome. How will

this possibility of collusion affect the auction rules? Are some auction formats easier to collude than others?

So it is extremely important for you to have prior knowledge of Game Theory, Calculus and Statistics/econometrics and some familiarity with computer programming/estimation such as R, Matlab or Stata. If you have taken econometrics and or statistics course on regression analysis that is great! Since Auction Theory is about designing auction rules, and determining how bidders will behave, we will have to verify some of our claims. For example, it is not enough to just claim that eBay auction format is the same as the format used in silent charity auctions, we have to prove it. This means we will prove all our claims. This is where your exposure and training in Calculus and Statistics or even Computer Science will be useful. Having said that, Hanna (who is the TA for the class) and I will be available during the semester to help you with the proofs, but you will have to make an effort on your part and be an “active learner.”

## Textbook/Lectures/Papers

There is no textbook written that is appropriate for us, so learning will be based on three things:

1. My lecture notes (posted in UVACollab).
2. Research papers in the area (UVACollab).

There is a book called “Auction: Theory and Practice,” by Paul Klemperer. Click [HERE](#) to access it. I will also expect you to know basic statistics. A good introductory book is “Introductory Statistics,” Sheldon Ross.

## Lectures

There will be two lectures each week. You are expected to attend all of them. Lectures will be held on Tuesday and Thursday in Monroe 111 from 8:00 am-9:15 am.<sup>1</sup>

## Professor

Place and time for office hours.

<b>Name</b>	Gaurab Aryal
<b>Role</b>	Instructor Monroe 255
<b>Office Hours</b>	Thursday 2:00 pm–3:30 pm, or by appointment
<b>E-mail</b>	aryalg@virginia.edu

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<sup>1</sup> There is no penalty for missing lectures. But those who miss lectures often find it difficult to do well in the class.

## Grading Policy

There are no midterms or a final for this class. Your grade will be based on a paper you write using real data that I provide and on two class presentations. Depending on the final size of the class, students form and work in a group of 2. Each group will present and write their papers together. I will give you two real life auction datasets, you have to choose one. Each dataset comes with a set of questions (that I will choose) and your goal is to answer those questions by the end of the class. I will grade you on how well you answer those questions and how you approach the problem and how well you explain the data. Here is the final breakdown of the grades:

1. Basic Data Description – 10%.
2. Data Section – 10%.
3. Model – 10%.
4. Estimation Strategy – 7.5%.
5. Estimation Results – 7.5%.
6. First Presentation – 10%.
7. Second Presentation – 15%.
8. Final Paper – 30%.
9. Class Participation - 5%.

I will use the default grading scale for undergraduate courses <http://its.virginia.edu/sis/grading/gradethresholds.html#undergraduate> to determine the final grades.

## Scholastic Dishonesty

For the purpose of this class, students may work together on homework provided the following rules are followed: any collaboration must be noted at the end of your homework and each student must individually write up each homework assignment. Identical assignments will receive a zero score. The university has strict rules in relation to academic honesty. The underlying principle is that all work submitted for assessment (assignments, reports, exams, etc.) should be your own original work. Anyone committing scholastic dishonesty on an exam will receive an F for the class. For more on this see <http://www.virginia.edu/onmyhonor/honorNetscape.html>.

## Course Outline and Timetable

	A	B	C	D	E
1	Week	Class	Date	Topic	Due
2		1 T	27-Aug	<b>Introduction</b>	
3		Th	29-Aug	<b>Second Price Auction</b>	Group Formation and Topic Deadline
4		2 T	3-Sep	<b>First Price-Auction</b>	
5		Th	5-Sep	<b>First Price-Auction</b>	1 page Summary of the Data
6		3 T	10-Sep	<b>Empirical Analysis of Auctions -1 (Basic Identification and Estimation)</b>	
7		Th	12-Sep	<b>Myerson's Optimal Auction</b>	Detail Data Description (write a Data Section)
8		4 T	17-Sep	<b>Risk Aversion</b>	
9		Th	19-Sep	<b>Collusion</b>	Basic Auction Model to use for estimation
10		5 T	24-Sep	<b>Presentations by groups 1-3</b>	
11		Th	26-Sep	<b>Presentations by groups 4-6</b>	
12		6 T	1-Oct	<b>Presentations by groups 7-9</b>	
13		Th	3-Oct	<b>Presentations by groups 10-12</b>	
14		7 T	8-Oct	<b>Reading Day</b>	
15		Th	10-Oct	<b>Empirical Analysis of Auctions -2 (Data Analysis Q&amp;A)</b>	Estimation Strategy
16		8 T	15-Oct	<b>Generalized Second Price Auctions</b>	
17		Th	17-Oct	<b>Google's Online Advertisement Auction</b>	
18		9 T	22-Oct	<b>E-bay's Randomized Control Experiment to determine value of Online Ads</b>	Estimation Results
19		Th	24-Oct	<b>Empirical Analysis of Auctions -5 (Collusion in Medicare Medicaid auctions)</b>	
20		10 T	29-Oct	<b>Affiliated Auction</b>	
21		Th	31-Oct	<b>Affiliated Auction</b>	
22		11 T	5-Nov	<b>Multi-Unit Share auctions</b>	
23		Th	7-Nov	<b>Empirical Analysis of Auctions -4 (Electricity Auction)</b>	
24		12 T	12-Nov	<b>Presentation by groups 1-3</b>	Own Paper Presentation
25		Th	14-Nov	<b>Presentation by groups 4-6</b>	Own Paper Presentation
26		13 T	19-Nov	<b>Presentation by groups 7-9</b>	Own Paper Presentation
27		Th	21-Nov	<b>Presentation by groups 10-12</b>	Own Paper Presentation
28		14 T	26-Nov	<b>Discussion about the class papers</b>	
29		Th	28-Nov	<b>Thanksgiving</b>	
30		15 T	3-Dec	<b>Multi-unit Auctions: case of US treasury bills</b>	
31		Th	5-Dec	<b>Privacy and Auctions</b>	Final Paper Due
32					