Econ 4620 (Game Theory) Syllabus

Teacher: Sean Inoue
Email: sinoue@lsu.edu
Office Hours: By appointment only. (Feel free to send me emails.)
Term: Spring 2020
Time and Location: M/W 3:00 PM-4:20 PM through Zoom.
TA: Joshua Scott
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Overview

This class provides an in-depth overview of Game Theory. By the conclusion of the term, the students will have an intuitive understanding of the building blocks of Game Theory, and will be able to analyze many different problems that exhibit a strategic setting. Game Theory has many applications outside of Economics, such as to Biology (evolutionary Game Theory), Psychology (behavioral Game Theory), Computer Science, Mathematics, and other social sciences. Although the focus of the course will be on Economic applications of Game Theory, the knowledge of Game Theory provided by this course will be broad enough such that students who master the material can apply the concepts learned to many different scenarios.

The content of the class will be divided into three sections, which will form the basis for the three exams. The first part of the course will cover the basics of Game Theory, which includes game trees, strategic form, aspects of games, characterizations of games, strategies, backward induction, Nash equilibrium, subgame perfect equilibrium, rationality, and mixed strategy Nash equilibrium. The second part of the course will focus on basic applications of Game Theory, including continuous games, bargaining, repeated games, and firm competition. The last section of the course will focus on games with hidden information, including Bayesian Nash equilibrium, perfect Bayesian equilibrium, pooling vs separating equilibrium, Bayes' rule, auctions, and communication games.

Throughout the course mathematics will be utilized frequently. This course will introduce some probability theory and calculus to allow for detailed analysis of models. While Game Theory can be done without these tools, some of the models would suffer from oversimplification, and students who wish to do further studies in Economics will find these math skills invaluable.

Course Text

I strongly recommend the book "Strategy, an Introduction to Game Theory." The text is not necessary to do the homework, but is useful as a reference. The notes from the in-class portion will not be provided in this class, so this book is a useful tool in case you are struggling and provides supplementary problems. At the end of the syllabus, I will include the relevant chapters from the text along with the material covered on a day. Other recommended books include "Games, Strategies, and Decision Making" by Joseph E. Harrington Jr. and "An Introduction to Game Theory" by Martin J. Osborne.

Attendance and class participation policies

Attendance is not required except on the first day of class and exam days, although it is heavily encouraged since notes are not provided outside of class. **The content of the course is rigorous in nature, and builds on itself much like a math course would, so frequently missing class will have severe negative impacts on your grade.** During class students are also encouraged to participate in activities and ask questions.

Homework

In this class, there will be four homework assignments due on January 29th, February 12th, March 16th, and April 20th. Each homework will be worth 5% of the overall grade. Homework is due before the start of class on the appropriate date. The primary purpose of the homework is to provide students with feedback about their understanding about the material prior to the tests. Homework may be completed in groups of 1-3 people. **Work completed in homework must be the work of the group that turns in the homework**. Homework must be turned in during class and at the beginning of class. Late homework emailed directly to Sean between the start of class on the due date and 24 hours after the due date will be accepted with 20% of that homework grade deducted as a penalty. Answer keys will be posted online 48 hours after homework is due. In addition to the homework that is due, I will list additional recommended problems.

Project

In this class, each student will (either individually or in a group) complete a project, which is worth 20% of your total course grade. The purpose of this project is for each student to explore how Game Theory applies to the world around us. Each student will complete this project in a group of 1-4 people. Sometime after the first section has concluded, we will decide on these groups.

The requirements for this project are as follows:

Each group will take a "situation" and create a simple, game theoretic model which that

group will solve through. This situation can be a scene from a movie, a game, or a real-world scenario. Original thought should be the center of this idea, so you shouldn't take an example directly from an example that I went over in class or from a paper that you find. Groups should push themselves to either write down a more general model, or to look at different versions of the game they are analyzing. For example, writing down a prisoner's dilemma and solving just that will not earn you a good grade on the project. The situation that you pick should be inspired by what **you** are interested in. **This paper should be no less than 3 pages, double-spaced. with 12 pt font.** Instead of analyzing a model in this way, students can also choose to run an experiment in the class to test the predictions of Game Theory.

In this project, you should clearly outline what you are modeling and why it is interesting. You should then clearly define the model, meaning that you should write down the players, the strategy space, and the payoffs. You should also go through a simple example that gives a flavor of what the solution looks like, and you should conclude by discussing your predicted solution and how it ties in to the situation you are modeling.

Students who choose to run an experiment should still follow the same steps above, but should detail why it is they are running an experiment. In addition, students should detail the results of the experiment and why it matches or mismatches the theory.

I will show you multiple examples of the kinds of things I'm looking for in class. **This project will be due on April 20th**.

Grade Breakdown & 'Optional Final'

At the final class of the semester, students can choose have the final not count towards their final grade. Students **must** sign a waiver in class on April 27th. If a student fails to sign the waiver and fails to show up at the final, they will be given a grade of 0 on the final. If a student signs the waiver, the final will count as 0 points towards the final grade.

If a student chooses to sign the waiver, their course grade will be based on the following:

Homework (4)	20% (5% each)
Midterm 1	20%
Midterm 2	20%
Midterm 3	20%
Project	20%
Final	0%
Total	100%

If a student does not sign the waiver, their course grade will be based on the following:

Grade in the course before the final	66%
Grade on the final	33%
Total	100%

Grades will be calculated based on a traditional $\pm$ scale (97-100=A+, 93-96.99=A, 90-92.99=A-, etc...)

Grading and Exam Policy

The exams will (tentatively) take place in class on Wednesday February 19th. Take home exams will be posted on, March 30th, April 22nd, and the (optional) final will be posted on Wednesday May 29th. Take home exams must be turned in no later than 48 hours after they are posted. Late exams will receive a 0. Students may not consult other humans on take-home exams: only the textbook and notes may be consulted. Sean may be contacted for questions but will not help the students with the content of the exams. A student who needs to miss an exam must notify me as early as possible before the scheduled exam time with a valid excuse unless it is a medical emergency (vacation/set dates of travel are not appropriate excuses), and must not have missed any other exam. Students who email me with a valid excuse will have the final make up the missing exam. Students who fail to attend an exam without a valid excuse will be given points as if that student had shown up and written only their name on an exam. Students who miss an exam due to illness or other emergency should contact me as soon as it is reasonable to do so.

'Optional' Final Exam

This course will have an 'optional' final exam. **Students who do not wish to take the final must be present in class on April 27th to sign a waiver indicating that they wish for the final to not count towards their final grade.** No other forms of opting out will be accepted. Students who do not opt out will have the final count towards their final grade, and any student who chooses not to opt out and does not show up will receive a 0 on the final exam, which will then be factored into their grade.

Classroom Behavior Policy

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. In this class, please refrain from behavior that would distract others from learning.

Special Needs/Accommodations

At Louisiana State University we strive to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Office of Disability Resources (http://www.lsu.edu/disability/) to explore reasonable accommodation.

Code of Academic Integrity

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the LSU Code of Academic Integrity as described in the LSU General Catalog. See https://www.lsu.edu/saa/students/codeofconduct.php. For undergraduate students found to violate this code, the outcome will range from failing the assignment to failing the class along with disciplinary probation.

Office Hours and Email Policy

Office hours will be held by myself on Monday and Wednesday from 10:00-11:00 or by appointment. Generally, any email sent to me will receive a response within 24 hours.

Subject to Change Statement

All information in this Syllabus, outside of the grading and exam policy, is subject to change by the instructor with advance notice.

Tentative Schedule:

Date	Topic	Chapters/Homework
	January	
13 M	**No Class**	
15 W	What is a game? Extensive Form	1, 2
20 M	**MLK, no class**	
22 W	What is a strategy? Zero-sum game	14,15, 2,3
25 S	Nash equilibria, Strategic	3,9
27 M	Extensive to Strategic, Strictly/Weakly Dominant	3, 6
29 W	Strictly/Weakly Dominated, IDSDS/IDWDS	6,7 **HW 1 due**
	February	
3 M	Location Game, Subgame Perfect Equilibria	8,15
5 W	SPE, Mixed Strategy NE	15, 11
10 M	Mixed Strategy NE, gaps	11 **Exam 1 Cutoff**
12 W	Continuous Games, Ultimatum Game	**HW 2 Due**, 19
17 M	**Review 1**	
19 W	**Exam 1**	
24 M	**Mardi Gras, no class**	
26 W	Project Discussion	
	March	
2 M	Cournot, Betrand	16
4 W	Bertrand, Stackelberg, Repeated Games	16, 22
9 M	Finitely/Infinitely Repeated Games	**Exam 2 Cutoff**, 22
11 W	Repeated Games	**Homework 3 Due**
16 M	Class Cancelled	
18 W	Class Cancelled	
23 M	**Spring Break, no class**	
25 W	**Spring Break, no class**	
30 M	Bayesian Nash Equilibrium	**Exam 2 Posted 12:00 PM**
	April	
1 W	Bayes' Rule	**Exam 2 Due before 12:00 PM**
6 M	Perfect Bayesian Equilibria	
8 W	Auctions	
13 M	Project Day	**Exam 3 cutoff**
15 W	Communication Games (EC on Exam 3)	**Homework 4 Due**
20 M	**Project Due, Review 3**	**Project due**
22 W	**Exam 3 posted 12:00 PM**	**due Friday 24th by 12:00 PM**
27 M	Hand back exam/project and sign final waiver.	Last Day of Class
29 W	**Final Exam Posted 12:00 PM,**	**due Friday May 1st by 12:00 PM**