

Econ 345A (Games and Strategies) Syllabus

Professor: Sean Inoue

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Office: All office hours will be conducted through Zoom

Open Office Hours: 4:00-5:00 Monday, 3:00-4:00 Wednesday, 4:00-5:00 Friday or by appointment (MWF afternoons are best).

Term: Fall 2020

Time: MWF 11:40 AM-12:30 PM

Location: Zoom and TBD

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. **If you feel even the slightest bit uncomfortable with math, consider attending the ungraded Calculus refresher course taught by Nazmul Islam on Wednesday, Sept 2 and Friday, Sept 4.** Details about this course will be uploaded to Moodle, but there are multiple sections to accommodate everyone.

Course Text

I strongly recommend the book “Strategy, an Introduction to Game Theory,” by Joel Watson. 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.

Instructional Approach

This course will be taught online (through Zoom) at the allotted for the first two weeks, in accordance with the Colgate University policy. After, courses will be taught in person and I will simultaneously stream lectures to zoom. Additionally, lectures after Thanksgiving will be taught fully through zoom. Videos will be recorded for the first two weeks. **I reserve the right to switch to online-only instruction at any time during this semester.**

Attendance and Class Participation Policies

Regular attendance and class participation are expected. The exams and homework are both based on the materials that I cover in class, and while the textbook can be a useful guide, it cannot replace the experience of being in a classroom.

Homework

In this class, there will be four homework assignments due. 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 1-4 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. Please submit homework as a single file, if possible. 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.**

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.

I will show you multiple examples of the kinds of things I’m looking for in class. **This project will be due on the date of the final.**

Grade Breakdown

In this class you will earn your grade according to the following breakdown:

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

Grades will be assigned using the following cutoffs:

90% : A range

80% : B range

68% : C range

60% : D range

With – and + assigned where appropriate. The average grade in this course will be a B–.

Grading and Exam Policy

Exams will be scheduled upon completion of a section, but the first two exams will both take place before Thanksgiving. The final exam will be a take-home exam. 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, depending on the circumstances, either make up the missed midterm or have another test count in place of the missed exam. Students who fail to attend an exam without first notifying me with a proper excuse will be given a 0 on the exam. Students who miss an exam due to illness or other emergency should contact me as soon as it is reasonable to do so.

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. While in-person, please socially distance and wear a mask at all times. Additionally, refrain from behavior that would distract others from learning.

Special Needs/Adjustments

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. Please contact Evelyn Lester, Director of Disability Services at 315-228-7375 in the Center for Learning, Teaching, and Research who reviews documentation to determine and help coordinate reasonable and appropriate adjustments for students with disabilities.

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 Code of Academic Integrity as described in the Student Handbook. See <https://www.colgate.edu/current-students/student-handbook/student-rights-and-responsibilities/academic-honor-code-and-for-details> for details. 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

Open office hours will be held by myself on 4:00-5:00 Monday, 3:00-4:00 Wednesday, 4:00-5:00 Friday or by appointment (MWF afternoons are best). 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.

Schedule

Chapters	Topic
Section 1: Basics of game theory	
Ch. 1	What is a game?
Ch. 2	Extensive Form
Ch. 14,15, 2,3	What is a strategy?
Ch. 3,9	Nash equilibria and Strategic/Normal Form
Ch. 3	Extensive to Strategic Form
Ch. 6	Strictly/Weakly Dominant Strategies
Ch. 7	IDSDS/IDWDS
Ch. 8	Location Games
Ch. 15	Subgame Perfect Equilibria
Ch. 11	Mixed Strategies and Mixed Strategy Nash Equilibria
Section 2: Applications of the Basics	
Ch. 19	Continuous Games, Ultimatum Bargaining Game
Ch. 16	Firm Competition: Cournot, Bertrand, Stackelberg
Ch. 22	Finitely/Infinitely Repeated Games
Section 3: Asymmetric Information	
Ch. 24, 26	Bayesian Nash Equilibria
Ch. 28	Bayes' Rule
Ch. 28	Perfect Bayesian Equilibria
Ch. 27	Auctions
	Extra Topic (Communication)