

Department of Economics
The Ohio State University
Economics 5001: Game Theory

Syllabus and Course Outline

James Peck
Spring 2022

Tuesdays and Thursdays 2:20-3:40pm
Journalism 300

Office Hours: Wednesdays 10-11am, Thursdays 4-5pm. We will start the semester with online Zoom office hours. Zoom appointments can be arranged for other times, and I reserve the option to switch to in-person office hours (440 Arps).

Course Objectives: This course provides a rigorous introduction to the field of Game Theory, by presenting the underlying theory and providing illustrative examples.

Learning Outcomes:

- After completing this course, you will be able to formulate a strategic situation as a non-cooperative game in either normal form or extensive form.
- You will be exposed to commonly studied games such as the prisoner's dilemma or the Cournot game of quantity competition.
- You will learn how to determine an optimal strategy, given the strategies you expect the other players to choose.
- You will learn how to solve a game for the strategies of all the players, based on the relevant solution concept of either (i) iterated dominance, (ii) Nash equilibrium, (iii) mixed strategy Nash equilibrium, (iv) subgame perfect Nash equilibrium, (v) Bayesian Nash equilibrium, or (vi) perfect Bayesian equilibrium.

Course Delivery: The lectures are all planned to be delivered in person, in Journalism 300, although circumstances may require a few lectures to be held on Zoom, in which case the link will be posted on Carmen. Please check for announcements on Carmen before each class, and do not share the link with anyone.

Assignments will be posted on Carmen and exams will take place in the classroom. Scores will be posted on Carmen, and **yes, there is a curve**. Previous years' exams and other materials are available at: www.econ.ohio-state.edu/jpeck/Econ5001.htm

Course Requirements:

First Midterm Exam (Tuesday February 8):	25%
Second Midterm Exam (Thursday March 10):	25%
Final Exam (Wednesday April 27, 2:00-3:45pm):	35%
Homework:	15%

There will be no make up exam for the midterms. Students who have a valid, *pre-approved* excuse for missing a midterm will have the other midterm count for 35% of the grade and the final exam count for 50% of the grade.

Study groups are allowed on the homework assignments, in which you can discuss the questions and talk about how to solve them. However, you need to write up the answers individually and without help. Homeworks are to be submitted as file uploads onto Carmen. Homework grades are based on full credit for a good faith effort submitted on time, half credit for submitting on time but not providing a good faith effort, and zero credit otherwise.

Students have the option of submitting a short (2-4 pages) extra credit paper that takes a strategic situation in real life or from some other source (movie, TV, etc.), models the situation as a game, and solves the game. This must be original work! The extra credit score will replace the lowest score received for a homework assignment. In addition, for students on the borderline between D+ and C-, extra credit will be viewed very favorably. Extra credit papers are due on the last day of class, unless separate arrangements are made in advance.

We will occasionally run some classroom experiments to illustrate the material, using MobLab. Instructions for participating, including downloading the app to your smartphone or tablet will be explained later in the course. Participation is strongly encouraged, but it is optional, and it will not be part of the grade.

Textbook: Watson, Joel, “Strategy: An Introduction to Game Theory,” W. W. Norton & Company, Third Edition, 2013.

Other texts (not required):

Osborne, Martin J., “An introduction to Game Theory,” Oxford University Press, 2004.

Harrington, Joseph E. Jr., “Games, Strategies, and Decision Making,” Worth Publishers, 2014.

Course Outline

0. Introduction

Watson, Chapter 1.

I. Defining a Game

A. Extensive Form Games (first pass)

Game trees, information sets, and payoffs. Modeling simultaneity.

Watson, Chapter 2.

B. Normal (Strategic) Form Games

Strategy set, strategy, strategy profile, payoff function, matrix form, relation to the extensive form, examples of normal form games.

Watson, Chapter 3.

C. Mixed Strategies and Expected Payoffs

Beliefs about strategy choices of the other players, mixed strategy, expected payoff.

Watson, Chapter 4.

D. Rationality and Common Knowledge

Interpretation of payoffs as utility, risk aversion and altruism, common knowledge of rationality, bounded rationality.

Watson, Chapter 5.

II. Solving Normal Form Games

A. Dominance and Best Response

Dominated strategy, weakly dominated strategy, dominant strategy, efficient strategy profile, best response, undominated strategies, tension between individual incentives and efficiency.

Watson, Chapter 6.

B. Rationalizability and Iterated Elimination of Dominated Strategies

Iterated dominance, rationalizable strategy, dominance solvable, strategic uncertainty, coordination problem, location game example.

Watson, Chapters 7,8.

C. Nash Equilibrium

Definition of NE, finding NE of matrix games, interpretations of NE, experimental game theory, the example of the Braess paradox.

Watson, Chapter 9.

D. Oligopoly Games and Voting Games

The Cournot model, the Bertrand model, two- and three-candidate platform competition.

Watson, Chapter 10.

E. Mixed-Strategy Nash Equilibrium

Matching pennies example, general definition, calculating the mixed-strategy NE, an oligopoly entry game, Nash's theorem.

Watson, Chapter 11.

III. Extensive Form Games

A. Details of the Extensive Form

Initial node, predecessor nodes, successor nodes, terminal nodes, rules for game trees, perfect and imperfect information, actions and strategies, Nash equilibrium, extensive form NE.

Watson, Chapter 14.

B. Backward Induction and Subgame Perfection

Sequential rationality, backward induction in games of perfect information, subgame perfection, the centipede game, the chain-store game, Stackelberg competition.

Watson, Chapter 15.

C. Repeated Games

Definition of a repeated game, finitely repeated prisoner's dilemma, infinitely repeated prisoner's dilemma, grim trigger strategy, the folk theorem, infinitely repeated chain store game.

Watson, Chapter 22.

IV. Extensive Form Games with Imperfect Information

A. Incomplete Information

Incomplete information vs. imperfect information, types and Bayesian normal form representation, extensive form games with chance moves, Bayesian extensive form representation.

Watson, Chapter 24.

B. Bayesian Nash Equilibrium

Cournot game with cost uncertainty, auctions.

Watson, Chapters 26, 27.

C. Extensive Form Games with Imperfect Information and Sequential Play

Beliefs off the equilibrium path, Perfect Bayesian Equilibrium, the beer and quiche game.

Watson, Chapter 28.

Attendance, participation, and discussions

Student participation requirements

The following is a summary of everyone's expected participation:

- Attend all lectures
- Complete all assigned coursework

Other course policies

Student academic services

Student academic services offered on the OSU main campus
<http://advising.osu.edu/welcome.shtml>.

Student support services

Student support services offered on the OSU main campus <http://ssc.osu.edu>.

Academic integrity policy

Policies for this course

- **Midterms and exams:** You must complete the midterm and final exams yourself, without any help, communication, or copying.
- **Reusing past work:** In general, you are prohibited in university courses from turning in work from a past class to your current class, even if you modify it. If you have any questions, please discuss the situation with me.

Ohio State's academic integrity policy

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>.

Copyright disclaimer

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Statement on title IX

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to

offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at <http://titleix.osu.edu> or by contacting the Ohio State Title IX Coordinator, Mollie Peirano, at titleix@osu.edu

Accessibility accommodations for students with disabilities

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

Accessibility of course technology

This course requires use of Carmen (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations with your instructor.

- [Carmen \(Canvas\) accessibility](#)

Your mental health

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614- 292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273- TALK or at suicidepreventionlifeline.org