

*Department of Business Economics & Public Policy
The Wharton School - University of Pennsylvania*

BEPP 284 - Game Theory for Business and Life

Prof. Joseph Harrington
harrij@wharton.upenn.edu

The objective of this course is to make you *more strategic*, by which I mean enhancing your capacity for making intelligent and creative choices when interacting with your fellow human beings. The approach to doing so is game theory, which has been the focus of two rounds of Nobel Prizes in Economics. Game theory is a framework and a set of tools for solving the puzzles and tackling the challenges put forth by a collection of conscious, purposeful agents, whether they comprise a household, a team, a fraternity or a sorority, a village, a company, an army, a market, a government, or a society. While the focus is primarily on the use of game theory in business, game theory has such broad relevance that we will also apply it in the arenas of politics, international relations, war, sports, history, crime, theology, and everyday life.

A course on how game theory informs strategy could be taught at many levels and, in principle, some insight could be conveyed without a student ever solving a game-theoretic model. However, if one is to really understand this insight and be able to produce new insight, you need to know how to model a strategic situation as a game and how to solve it. This course then has three objectives: 1) learn some game theory; 2) acquire some insight into strategic situations; and 3) have an intellectually stimulating and enjoyable time.

Book

Joseph Harrington, *Games, Strategies, and Decision Making*, 2nd Edition, Worth Publishers, 2015. [GSDM]

Pre-requisites: None

“But it's so simple. All I have to do is divine from what I know of you: are you the sort of man who would put the poison into his own goblet or his enemy's? Now, a clever man would put the poison into his own goblet, because he would know that only a great fool would reach for what he was given. I am not a great fool, so I can clearly not choose the wine in front of you. But you must have known I was not a great fool, you would have counted on it, so I can clearly not choose the wine in front of me.”

- Vizzini,
The Princess Bride

Overview of Lectures (with Applications)

Introduction to game theory - GSDM (Chp 1)

Modelling a strategic situation as a game - GSDM (Chp 2)

- Kidnapping

Optimal play by eliminating dominated strategies - GSDM (Chp 3; skip Appendix on Rationalizability)

- Existence of God
- Product introduction: chewy cookies and generic cigarettes
- Steroids in sports

Strategic play when there are few actions - GSDM (Chps 4, 5)

- Dr. Seuss' *The Sneetches*
- Bidding to take advantage of a poorly designed auction: Average bid procurement auctions in Italy
- Network effects and the dominance of Microsoft
- Catching cartels with the U.S. Department of Justice's Corporate Leniency Program

Strategic play when there are many actions - GSDM (Chp 6)

- Rent-seeking and lobbying
- Pricing in a two-sided market: online auctions and video games

Randomizing play - GSDM (Chp 7)

- Penalty kick in soccer
- Kitty Genesove and the Volunteers' Dilemma

“I can calculate the motions of heavenly bodies, but not the madness of people.”
- Sir Isaac Newton
(upon losing £20,000 in the South Sea Bubble in 1720)

“At Bell Atlantic, we've found that the lessons of game theory give us a wider view of our business situation and provide us a more nimble approach to corporate planning.”
- Raymond W. Smith, Chairman

“If the human mind was simple enough to understand, we'd be too simple to understand it.”
- Emerson Pugh

Strategic play in sequential-move environments with perfect information - GSDM (Chp 8)

- Racial discrimination and sports
- "Look forward, reason backward": Slanket and Softsoap
- Sequential investment and the hold-up problem: Holland Sweetener

"Game theory forces you to see a business situation over many periods from two perspectives: yours and your competitor's."

- Judy Lewent, CFO Merck

Strategic play in sequential-move environments with imperfect information - GSDM (Chp 9)

- Making managers aggressive: East India Trade in the 19th Century
- Capacity investment and entry deterrence: DuPont and titanium dioxide
- Land conflict in Ethiopia
- Softening competition through product location: computer printers

"Imagine how hard physics would be if electrons could think."

- Murray Gell-Mann (Nobel Laureate, Physics)

Strategic play when there is repeated interaction - GSDM (Chps 13-15)

- Cooperation: Trench warfare in World War I
- Reciprocal altruism: Vampire bats
- Medieval Law Merchant and markets in the middle ages

"If there is any one secret of success it lies in the ability to get the other person's point of view and see things from their angle as well as your own."

- Henry Ford

Course Requirements

Problem Sets (5): 15% (average of the best four problem sets; lowest problem set grade is dropped)

Tests (2): 40% (20% each)

Final Examination (comprehensive): 25%

Participation and Experiments: 10%

Virtual Corporate Reality: 10%

Problem Sets: Unless stated otherwise, a problem set is due one week after it is assigned. As answers will be distributed at the end of class on the day the problem set is due, late problem sets cannot be accepted.

Modelling Day: Students are required to bring to class a written description of a strategic situation (about half of a page). The situation can be either a routine interaction that occurs in the real world or a particular situation which can be recent or historical. However, it cannot be fictional or one that we have gone over in class. On Modelling Day, a few of these descriptions will be randomly selected, and the class will, in real time, model those situations. This exercise serves two purposes. First, it encourages students to look for strategic situations in their environments. Second, it promotes the skill of distilling a real-life situation to a manageable model that one can use to think through and analyze.

Participation and Experiments: Over the course of the semester, students will participate in experiments involving strategic reasoning. These experiments are tied to key concepts in class and are actually quite fun. Students are incentivized by earning points that will be applied to their course grade. Active participation in class discussion will also contribute to your grade.

Virtual Corporate Reality: VCR is an industry simulation package that I co-developed with Professor Christopher Ruebeck at Lafayette College. Students will form teams and compete in a market setting. Your grade will be based on the value of your company at the end of the semester. It is to be emphasized that your team's value will NOT be compared to the value of other teams in your market but rather to average value based on this simulation from past

“One of the reasons game theory has finally been discovered by managers is the rapidity with which companies can now respond to changes in product, technologies and prices. Game theory helps you pay attention to your interactions with competitors, customers and suppliers, and to focus on the end-game so that your near-term actions promote your long-term interest by influencing what these players do.”

- F. William Barnett,
McKinsey &
Company

semesters. Details are provided in a separate document.

Attendance: While attendance is not mandatory, 10% of your grade is tied to participation and in class experiments. If you miss an experiment without having received approval prior to class, you will receive zero points on that experiment.

“Only the paranoid survive.”
- Andy Grove, Co-founder of Intel

Electronics: The use of laptops, tablets, smartphones, smartwatches, tin cans with string, carrier pigeons, telepathy, seances, or any other method that connects you to the world outside of this classroom is *verboten* during class, unless an exception is announced.

“I think that God in creating Man somewhat overestimated his ability.”
- Oscar Wilde

Ethics: You are expected to review and abide by the University of Pennsylvania's Code of Academic Integrity. Violations of the code carry serious sanctions. All cases of code violations will be turned over to the Office of Student Conduct and I reserve the right to impose additional sanctions, including a failing grade for the assignment or exam and for the course. In other words, it's a nasty business that you want to avoid.