

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

BEPP 284 - Game Theory for Business and Life (Fall 2021)

Prof. Joseph Harrington harrij@wharton.upenn.edu

Office Hours: M, Th 4:00-5:00 (Vance Hall 331) or by appointment (virtual)

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 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.

BEPP 284 satisfies the “Technology, Innovation and Analytics” requirement for the Wharton undergraduate major.

BEPP 284 satisfies the BEPP Fundamental requirement for the BEPP Concentration.

Pre-requisites: None

Book: Joseph Harrington, *Games, Strategies, and Decision Making*, 2nd Edition, Worth Publishers, 2015. [GSDM] (While the 2nd Edition is preferred, the 1st Edition is acceptable.)

Teaching Assistants

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“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

Optional Readings

Basu, Kaushik, "Why, for a Class of Bribes, the Act of *Giving* a Bribe should be Treated as Legal," March 2011.

Brandenburger, Adam, "Bitter Competition: The Holland Sweetener Company versus Nutrasweet," HBS Case 9-794-079, November 13, 2000.

"Football Penalties: A Practical Guide to the Most Nail-biting Part of the World Cup," *The Economist*, June 21, 2018

Hammond, Scott D., "The Evolution of Criminal Antitrust Enforcement Over the Last Two Decades," February 25, 2010.

Khazan, Olga, "Can Game Theory Help Prevent Rape?," *The Atlantic*, September 17, 2015.

Shapiro, Carl and Hal R. Varian, "Networks and Positive Feedback" (Chp 7) in *Information Rules: A Strategic Guide to the Network Economy*, HBS Press, 1999.

Course Requirements

Quizzes (5 at 10% each): 50%

Note: If you miss a quiz for an acceptable reason (such as illness or a death in the family) then the 10% will be added to the final exam. Transfer of the 10% requires approval prior to the quiz.

Comprehensive final exam: 25%

Virtual Corporate Reality: 20%

Attendance and participation: 5% (Note: Attendance is required.)

"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)

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

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)

- Advertising: cooperative vs. predatory
- Existence of God
- Product introduction: cookies and cigarettes
- Doping in sports

Strategic play and Nash equilibrium - GSDM (Chps 4, 5, 6.1-6.2)

- Catching cartels (Reading: Hammond)
- The Sneetches
- Average bid procurement auctions in Italy
- Network effects and the computer industry (Reading: Shapiro & Varian)
- Braess' Paradox
- Vaccination

Randomizing play - GSDM (Chp 7)

- Avranches Gap in World War II
- Penalty kick in soccer (Reading: "Football Penalties")
- Volunteers' Dilemma and the Bystander Effect

"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)

- Investment and hold-up (Reading: Brandenburger)
- Racial discrimination and a sports draft
- Bribery in India (Reading: Basu)
- Bargaining

“Imagine how hard physics would be if electrons could think.”

- Murray Gell-Mann
(Nobel Laureate,
Physics)

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

- Sexual harassment (Reading: Khazan, 2015) -
Trigger Warning
- Agenda control
- Group formation

Strategic play when there is repeated interaction

- Trench warfare in World War I (GSDM, Chp 13)
- Bidding rings (GSDM, Chp 14)
- Medieval Law Merchant (GSDM, Chp 15)
- Cooperation by bats (GSDM, Chps 14, 16.1)

“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

Quizzes

Quizzes will occur during the first 45 minutes of class on dates listed at the end of the syllabus. After a quiz has been completed, students are required to remain until the end of class; they cannot leave early. In addition to attending lectures and reading the textbook, recommended preparation is that you work through the problems available on Canvas.

Virtual Corporate Reality (VCR)

VCR is an industry simulation package co-developed with Prof. Christopher Ruebeck at Lafayette College. Students will form teams and compete in a market setting. 50% of 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 industry but rather to a benchmark based on past semesters.) The other 50% of your grade will be based on three short reports that you will turn in over the course of the simulation. Details on VCR are provided in a separate document, and the VCR program is available at <https://vcr.lafayette.edu/cgi-bin/login.cgi>.

Electronics

Laptops and smartphones may be used in class but for only two purposes: 1) reviewing lecture slides and taking notes; and 2) participating in online surveys. You are NOT to use them for any other purpose. If you are seen smiling while looking at your device, it will be inferred you are not viewing class material.



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 course.

“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

BEPP 284 - Game Theory for Business and Life - Fall 2021						
Lecture	Date	Topic	Quizzes	Required Readings	Optional Readings	VCR
1	9/1/2021	Introduction		Chp 1		
2	9/8/2021	Extensive Form Games		Chp 2		
3	9/13/2021	Strategic Form Games				
4	9/15/2021	Iterative Deletion of Dominated Strategies		Chp 3		
5	9/20/2021	Iterative Deletion of Dominated Strategies				
6	9/22/2021	Iterative Deletion of Dominated Strategies				
7	9/27/2021	Iterative Deletion of Dominated Strategies				Plan is due
8	9/29/2021	Nash Equilibrium		Chps 4, 5	Hammond	
9	10/4/2021	Nash Equilibrium	Quiz #1 (IDSDS)			
10	10/6/2021	Nash Equilibrium: Tipping & Congestion			Shapiro & Varian	
11	10/11/2021	Nash Equilibrium: Tipping & Congestion				
12	10/13/2021	Nash Equilibrium with Randomized Actions		Chp 7		
13	10/18/2021	Nash Equilibrium with Randomized Actions			Football Penalties	Update is due
14	10/20/2021	Sequential Play and Perfect Information	Quiz #2 (Nash equilibrium)			
15	10/25/2021	Sequential Play and Perfect Information		Chp 8		
16	10/27/2021	Sequential Play and Perfect Information			Brandenburger	
17	11/1/2021	Sequential Play and Perfect Information				
18	11/3/2021	Sequential Play and Imperfect Information	Quiz #3 (Sequential play - perfect)	Chp 9	Basu	
19	11/8/2021	Sequential Play and Imperfect Information				
20	11/10/2021	Sequential Play and Imperfect Information				
21	11/15/2021	Sequential Play and Imperfect Information			Khazan	
22	11/17/2021	Cooperation and Reputation	Quiz #4 (Sequential play - imperfect)	Chp 13		
23	11/22/2021	Cooperation and Reputation				
24	11/29/2021	Cooperation and Reputation		Chp 14, 16.1		
25	12/1/2021	Cooperation and Reputation		Chp 15		
26	12/6/2021	Debrief: Virtual Corporate Reality	Quiz #5 (Repeated games)			Final report is due
27	12/8/2021	Debrief: Virtual Corporate Reality				
	TBD	FINAL EXAM				