暨南大學
JINAN UNIVERSITY

Summer 2019

0201E340
Game Theory and Business Decision

Instructor: Michael Barry
Time: Monday through Friday (June 17, 2019 - July 19, 2019)
Office Hours: 2 hours (according to the teaching schedule)
Contact Hours: 60 (50 minutes each)
Credits: 4
Location: Huiquan Building
Office: Huiquan Building 518
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Course Description

This is a course on game theory and its application to economics. We will develop the basic tools of game theory through lectures and exercises, and we will put the tools to work by applying them to examples and cases. Game theory studies competitive and cooperative behavior in strategic environments, where the fortunes of several players are intertwined. It provides methods for identifying optimal strategies and predicting the outcomes of strategic interactions. The field of game theory began around 1900 when mathematicians began asking whether there are optimal strategies for parlor games such as chess and poker, and, if so, what these strategies might look like.

The first comprehensive formulation of the subject came in 1944 with the publication of the book Theory of Games and Economic Behavior by famous mathematician John von Neumann and eminent economist Oskar Morgenstern. As its title indicates, this book also marked the beginning of the application of game theory to economics. Since then, game theory has been applied to many other fields, including political science, military strategy, law, computer science, and biology, among other areas. In 1994 three pioneers in game theory were awarded a Nobel Prize, marking the arrival of the field. In 2005, two other prominent researchers in game theory were awarded a Nobel Prize.

The course assumes no previous coursework in game theory. It is not a math course, but it will require use of mathematics. Lectures will include theory and applications. Both are necessary for understanding the field. In addition, students will be asked to “play” the games and to present

some theory and examples to the class. Discussion helps understanding.

Required Texts

Osborne, Martin, and Rubinstein. A Course in Game Theory. Cambridge, MA: MIT Press. 1994 ISBN-13: 000-0262650401

Spaniel, William. Game Theory 101: The Complete Textbook CreateSpace, 2011 ISBN-13: 978-1492728153

Course Hours

The course has 25 sessions in total. Each class session is 120 minutes in length. The course meets from Monday to Friday.

Course Schedule

Please note that the schedule is meant to give an overview of the major concepts in this course. Changes may occur in this calender as needed to aid in the student`s development.

Week	**Class Period**	**Subject**	**Assignment/Exams**
Week 1	1	Introduction	
	2	Strategies and Nash Equilibrium	
	3	Mixed Strategy Games	
	4	Mixed Strategy Games	
	5	Discussion	
Week 2	6	Subgame Perfect Equilibria	Problem Set Due
	7	Backward Induction	
	8	Applications of Nash and Subgame Perfect Nash	
	9	Probability Distributions	
	10	Discussion	
Week 3	11	Applications of Subgame Perfect Nash	Problem Set Due
	12	Games with No Equilibria	
	13	Hotelling's Game, Duels, and Other Examples	
	14	MID-TERM EXAM	Mid-Term Exam
	15	Discussion	
Week 4	16	Expected Utility Theory	Problem Set Due
	17	Utility, Properties, Computation	
	18	Repeated Games	
	19	Efficiency	

	20	Discussion	
Week 5	21	Bayesian-Nash Equilibria	Problem Set Due
	22	Bayesian-Nash Equilibria	
	23	Perfect Bayesian Equilibria	
	24	Review	
	25	Final EXAM	Final Exam

Tentative Course Outline

A. <u>The Basics: Strategies and Nash Equlibrium</u>

a. The Prisoner's Dilemma and Strict Dominance
b. Iterated Elimination of Strictly Dominated Strategies
c. Pure Strategy Nash Equilibrium and the Stag Hunt
d. What Is a Nash Equilibrium?
e. Best Responses
f. Matching Pennies and Mixed Strategy Nash Equilibrium
g. The Mixed Strategy Algorithm
h. How NOT to Write a Mixed Strategy Nash Equilibrium
i. Battle of the Sexes
j. Calculating Payoffs
k. Strict Dominance in Mixed Strategies
l. Weak Dominance
m. Infinitely Many Equilibria
n. The Odd Rule
o. Extensive Form Games

B. <u>Subgame Perfect Equilibrium</u>

a. Backward Induction
b. How NOT to Write a Subgame Perfect Equilibrium
c. Multiple Subgame Perfect Equilibria
d. Games with Stages
e. Punishment Strategies
f. Tying Hands (Burning Bridges)
g. Commitment Problems
h. The Centipede Game
i. Problems with Backward Induction
j. Forward Induction
k. Advanced Strategic Form Games

C. <u>Probability Distributions</u>

a. Generalized Battle of the Sexes
b. Knife-Edge Equilibria
c. Soccer Penalty Kicks

d. Comparative Statics
e. The Support of Mixed Strategies
f. A Trick with Weak Dominance
g. Rock Paper Scissors
h. Symmetric, Zero Sum Games
i. Modified Rock Paper Scissors
j. Mixing among Three Strategies
k. Games with Infinite Strategy Spaces

D. Games with No Equilibria

a. Duels
b. Hotelling's Game and the Median Voter Theorem
c. Second Price Auctions
d. Expected Utility Theory

E. Introduction to Expected Utility Theory

a. The Completeness Axiom
b. The Transitivity Axiom
c. Rationality
d. Condorcet's Paradox and Social Preferences
e. Lotteries
f. Independence over Lotteries
g. The Allais Paradox
h. The Continuity Axiom
i. Expected Utility Transformations
j. Pareto Efficiency
k. Risk Averse, Risk Neutral, and Risk Acceptant Preferences

F. Repeated Games

a. Repeated Prisoner's Dilemma (Finite)
b. Discount Factors
c. Geometric Series and Infinite Payoffs
d. The One-Shot Deviation Principle
e. Grim Trigger in the Repeated Prisoner's Dilemma
f. Tit-for-Tat in the Repeated Prisoner's Dilemma
g. Tit-for-Tat Isn't Subgame Perfect
h. The Folk Theorem
i. Repeated Games and the Prediction Problem

G. Bayesian-Nash Equilibrium

a. Introduction to Incomplete Information
b. Bayesian-Nash Equilibrium
c. Finding Bayesian-Nash Equilibrium with Nash Equilibrium
d. Why Are There Antes in Poker?
e. Is More Information Always Good?
f. Condorcet Jury Theorem
g. Swing Voter's Curse
h. Cutpoint Strategies

i. The Purification Theorem
j. Second Price Auctions
k. First Price Auction
l. Bayes' Rule
m. Correlated Types
n. The Winner's Curse

H. **Perfect Bayesian Equilibrium**
a. Perfect Bayesian Equilibrium
b. When Uninformed Actors Move First
c. Signaling Games and Updating Beliefs
d. Separating Equilibrium
e. Pooling Equilibrium
f. Semi-Separating/Partially-Pooling Equilibrium
g. Single Raise Poker
h. The Chain Store "Paradox"
i. The Dominance Refinement
j. The Beer-Quiche Game and the Equilibrium Dominance Refinement
k. The D1 Refinement
l. Revealing Incriminating Evidence
m. Information Cascades

Grading Policy

Attendance/Participation	10%
Problem Sets	20%
Presentations	10%
Midterm Exam	25%
Final Exam	35%
Total	100%

Grading Scale

The instructor will use the grading system as applied by JNU:

Definition	Letter Grade	Score
Excellent	A	90~100
Good	B	80~89
Satisfactory	C	70~79
Poor	D	60~69
Failed	E	Below 60

Attendance

Attendance is mandatory in the class. It would be recorded each class and forms part of students` participation record. Students should inform the instructor at the earliest opportunity if they need to ask for a leave. All absences may have negative effect on students` final grades. Any students with more than three unexcused absences will automatically fail the course.

Academic Honesty

As members of the Jinan University academic community, students are expected to be honest in all of their academic coursework and activities. Academic dishonesty, includes (but is not limited to) cheating on assignments or examinations; plagiarizing, i.e., misrepresenting as one's own work any work done by another; submitting the same paper, or a substantially similar paper, to meet the requirements of more than one course without the approval and consent of the instructors concerned; or sabotaging other students` work within these general definitions. Instructors, however, determine what constitutes academic misconduct in the courses they teach. Students found guilty of academic misconduct in any portion of the academic work face penalties that range from the lowering of their course grade to awarding a grade of E for the entire course.