YORK UNIVERSITÉ UNIVERSITY

FACULTY OF LIBERAL ARTS & PROFESSIONAL STUDIES
DEPARTMENT OF ECONOMICS

GAME THEORY IN ECONOMICS
ECON 4130

Fall 2023

Tuesdays, 10:15 AM – 11:30 AM (R-S205)
Thursdays, 10:15 AM – 11:30 AM (ACW-303)

Instructor: Selçuk Özyurt

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(Virtual) Office Hours : Upon request

Teaching Assistant: Şükran Dinç

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Prerequisites: ECON 1530 and ECON 1540 or equivalents.

Course Description and Objective:

This course is an undergraduate level introduction to game theory and strategic thinking. It introduces the theory of non-cooperative games with emphasis on economic applications. Game theory is the study of multi-person decision problems where action of each decision maker (player) influences payoffs of others. In such environments, optimal decision may require strategic thinking; how one's action will influence the incentives of other players and whether others are aware of this interconnection.

Success in this course requires strong analytical and logical thinking and the habit of drawing conclusions based on qualitative information. The course requires a working knowledge of calculus (e.g., functions of one or several variables, derivatives), probability and optimization, which are covered by the prerequisite courses. For those students who need to refresh these concepts, a self-study videos are available on my YouTube channel (https://www.youtube.com/@selcukozyurt).

At the end of the course, students should be able to

- formulate any strategic interaction as a game form,
- understand solution concepts in normal and extensive form games, and
- develop analytical and problem-solving skills to analyze games.

This course is also a good preparation for students who are interested in pursuing graduate work in economics and finance.

Course Textbooks:

Main textbook:
"*Strategy: An introduction to Game Theory"* by Joel Watson (Referred as **JW**).

Additional (suggested) textbooks:
"*An Introduction to Game Theory"* by Martin Osborne
"*Game Theory for Applied Economists*" by Robert Gibbons

Course Regulations:

The list of topics for each week (the outline) is presented at the end of this syllabus and available on e-Class. For your own study, I will post some lecture notes and sample questions on eClass, and my detailed lecture videos on YouTube. Links to these videos are available on https://www.selcukozyurt.com/game-theory. It is your responsibility to go over these extra materials. We will discuss each topic on the outline during in-person lectures, and students' active class participation is expected. For this reason, students are expected to come to lectures prepared. I don't assign a fixed date or time for an office hour: Just e-mail me in advance to fix a date/time for virtual meeting over Zoom.

The final course grade will consist of six quizzes and a final exam, according to the following breakdown:

Quizzes : 40%
Final : 60%

Other than these, ***no extra credit or additional work is offered, and grades cannot be negotiated***.

All quizzes will be open book tests, have equal weights, and be held during class time. Working with a team, consisting of at most three students, will be allowed during quizzes, but all team members must be present during a quiz. If you miss a quiz for any reason, then you will simply get 0 point from that quiz, and there will be no make-up. However, I will drop two of your lowest scored quizzes from grade calculation. Please use this policy wisely as an insurance against any unfortunate event that might cause you miss any quiz.

The Final Exam will take place during the official exam period and include the material covered during the entire course. It will be a standard closed book exam (i.e., no collaboration with other students). A deferral for the Final Exam will be granted only for medical reasons. In such cases, students should submit a deferred exam application through the following website (CLICK HERE). The form must be completed **within 48 hours of the exam time.** The date and time of the deferred exam will be set at a later date.

Your letter grade will be calculated according to the following scheme:

100 – 90	A+
90 – 80	A
80 - 75	B+
75 - 70	B
70 – 65	C+
65 – 60	C
60 – 55	D+
55 – 50	D
50 – 40	E
40 – 0	F

Important Dates:

Wednesday, Sept. 6 – Fall 2023 semester begins.
Thursday, Sept. 7 – First meeting (a brief introduction)
Tuesday, Sept. 12 – Lecture 1
Wednesday, Sept. 20 – Last day of ADD without permission.
Thursday, Sept. 28 – Last day of ADD with permission (e-mail Alicia Cui: aliciaqc@yorku.ca).
Tuesday, Oct. 3 – Quiz 1 (covers lectures 1-6)
Thursday, Oct. 17 – Quiz 2 (covers lectures 7 & 8)
Tuesday, Oct. 31 – Quiz 3 (covers lectures 9 -12)
Tuesday, Nov. 7 – Quiz 4 (covers lectures 13&14)
Wednesday, Nov. 8 – Last day of DROP
Tuesday, Nov. 21 – Quiz 5 (covers lectures 15-18)
Tuesday, Dec. 5 – Quiz 6 (covers lectures 19-21)
Tuesday, Dec. 5 – Last lecture (Fall 2023 semester ends).

Important Course Information for Students

All students are expected to familiarize themselves with the following information, available on the Senate Committee on Academic Standards, Curriculum & Pedagogy webpage (see Reports, Initiatives, Documents): http://secretariat-policies.info.yorku.ca/

- Student Rights & Responsibilities
- Academic Accommodation for Students with Disabilities

In this course, we strive to maintain **academic integrity** to the highest extent possible. Please familiarize yourself with the meaning of academic integrity by completing SPARK's Academic Integrity module at the beginning of the course. Breaches of academic integrity range from cheating to plagiarism (i.e., the improper crediting of another's work, the representation of another's ideas as your own, etc.). All instances of academic dishonesty in this course will be reported to the appropriate university authorities, and can be punishable according to the Senate Policy on Academic Honesty.

Private Third-Party Tutoring Companies, Academic Honesty, and Support Resources

Many private, third-party tutoring companies advertise their services to YorkU students. One way you can help eliminate these advertisements is by changing your eClass profile settings to private (see instructions below). Some of these private companies claim to be affiliated with, or recognized and supported by, York University. Some also claim to help you by providing you with quiz and test answers, suggesting that this practice is safe and permitted by York. These claims are **not** true. York University has not officially recognized or endorsed any third-party tutoring service. When you are provided with quiz, test and exam answers, you run the risk of violating the **university's academic honesty policy**. Students have been caught using these services to cheat and gain unfair advantage over honest students. The cheating students and "tutors" have received academic dishonesty punishments ranging from failing courses, to being expelled, to losing their YorkU degrees. Officially supported resources to help students learn course material will be provided by YorkU officials, such as your professors and your department. These services are offered at no cost to you as a student. Your professor will likely provide weekly office help hours to meet with students and if you are a first- or second-year student and would like help with course material, make sure you join one of our weekly **Peer Assisted Study Sessions (PASS)**. If you require help with any of your numeracy-related courses that involve math, statistics or Excel, drop in online to meet with one of our peer tutors at the **Student Numeracy Assistance Centre at Keele (SNACK)**. If you are ever unsure of whether a resource is allowable or endorsed by YorkU, please feel free to email the Department of Economics at lapsecon@yorku.ca and they would be happy let you know.

To hide your email address in eClass: Step1: Click your name on the top-right of the eClass website, then click "Profile" on the drop-down menu; Step 2: Under "User details" click "Edit profile"; Step 3: From the "Email display" drop-down menu choose "Hide my email address from non-privileged users"; Step 4: Scroll to the bottom of the page and click on the "Update profile" button.

Course Outline

TOPIC 0: PRELIMINARIES

Lecture 0 (Sept. 7): A brief introduction.

1. Basic Concepts in Mathematics
2. Propositional Logic
3. Optimization
4. Probability
5. Introduction to Uncertainty and Risk
6. Risk Preferences
7. Expected Utility Theory
8. Expected Utility Theory at Work: Numerical Examples

TOPIC 1: INTRODUCTION TO GAME THEORY (Chapters 1-5 of JW)

Lecture 1 (Sept. 12):
1. Introduction to Game Theory

Lecture 2 (Sept. 14):
1. Strategy in Games
2. Normal (Strategic) Form Representation of Games

Lecture 3 (Sept. 19):
1. Examples for Normal Form Representation

Lecture 4 (Sept. 21):
1. Beliefs & Mixed Strategies
2. General Assumptions and Methodology
3. Efficiency in Games

TOPIC 2: BASIC SOLUTION CONCEPTS AND APPLICATIONS (Chapters 6-8 of JW)

Lecture 5 (Sept. 26):
1. Strategic Dominance
2. Best Response
3. Dominance versus Best response

Lecture 6 (Sept. 28):
1. Examples for Best Response and Strict Domination
2. Weak Dominance

Lecture 7 (Oct. 3):

1. Rationalizability & Iterated Elimination of Strictly Dominated Strategies (IESDS)

Lecture 8 (Oct. 5):

1. Applications for Rationalizability and IESDS

TOPIC 3: NASH EQUILIBRIUM (Chapters 9 and 10 of JW)

Lecture 9 (Oct. 17):

1. Nash Equilibrium: Why We Need?
2. Nash Equilibrium: Formal Definition and Intuition
3. Finding Pure Strategy Nash Equilibrium in Finite Simultaneous-Move Games

Lecture 10 (Oct. 19):

1. Finding Pure Strategy Nash Equilibrium in Cournot Duopoly Game

Lecture 11 (Oct. 24):

1. Finding Pure Strategy Nash Equilibrium in Bertrand Duopoly Game

Lecture 12 (Oct. 26):

1. Finding Pure Strategy Nash Equilibrium: Median Voting Theorem

TOPIC 4: MIXED STRATEGY NASH EQUILIBRIUM (Chapters 11 of JW)

Lecture 13 (Oct. 31):

1. Mixed Strategy Nash Equilibrium

Lecture 14 (Nov. 2):

1. Mixed Strategy Nash Equilibrium, Strict Dominance, and Efficiency

TOPIC 5: EXTENSIVE FORM GAMES WITH PERFECT INFORMATION (Chapters 14 & 15 of JW)

Lecture 15 (Nov. 7):

1. The Basics of Extensive Form Games
2. Nash Equilibrium in Extensive Games

Lecture 16 (Nov. 9):

1. Sequential Rationality and Backward Induction
2. Backward Induction, Subgame Perfect Nash Equilibrium & Nash Equilibrium

Lecture 17 (Nov. 14):

1. Examples for Subgame Perfect Nash Equilibrium

Lecture 18 (Nov. 16):

1. Extensive Games with infinitely Many Strategies: Stackelberg Duopoly

TOPIC 6: EXTENSIVE FORM GAMES WITH IMPERFECT INFORMATION (Chapter 16 of JW)

Lecture 19 (Nov. 21):

1. Subgame Perfection for Extensive Form Games with Imperfect Information

Lecture 20 (Nov. 23):

1. One Deviation Property: A Generalization of Backward Induction
2. An application: Advertising and Competition

Lecture 21 (Nov. 28):

1. An application: Cournot Competition Under Capacity Constraints
2. An application: Dynamic Monopoly and Price Discrimination

TOPIC 7: INTRODUCTION TO REPEATED GAMES (Chapters 22 & 23 of JW)

Lecture 22 (Nov. 30):

1. Finitely Repeated Games: Introduction
2. Finitely Repeated Games: History, stage game Nash equilibrium, and SPNE
3. Discount Factor in Repeated Games?
4. Infinitely Repeated Games and Grim Trigger Strategies

Lecture 23 (Dec. 5):

1. Infinitely Repeated Games and Folk Theorem
2. Tit for Tat Strategies and Infinitely Repeated Prisoners' Dilemma