



**FACULTY OF LIBERAL ARTS & PROFESSIONAL STUDIES
DEPARTMENT OF ECONOMICS**

**GAME THEORY IN ECONOMICS
ECON 4130**

Fall 2021
Mondays, 11:30 AM – 2:30 PM

(Tentative)

Instructor: Selçuk Özyurt

E-mail : ozyurt@yorku.ca (Always include “ECON 4130” in the subject line)
In-person Lectures : SLH E (Stedman Lecture Halls) – Starting October 18th, 2021
Virtual Office Hours : Upon Request

Teaching Assistant: Şükran Dinç

e-mail : sukrandi@yorku.ca
Virtual Office Hours : TBA

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. Although the course requires a working knowledge of calculus (e.g. functions of one or several variables, derivatives), probability (e.g. random variables, probability distributions, conditional probabilities, expectations) and optimization, we will review, to some extent, each notion before using it.

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.

We will cover (as time permits) all chapters of this textbook and beyond.

Additional (suggested) textbooks:

“*An Introduction to Game Theory*” by Martin Osborne

“*Game Theory for Applied Economists*” by Robert Gibbons

Course Regulations:

First four weeks of this course will be remotely delivered, and there will be no in-person interactions. In-person lectures will begin on October 18th, 2021 (the week after reading week) and continue until the end of the semester at designated time and place (conditional upon covid-19 restrictions). The list of topics that you are responsible each week will be posted on e-Class. For your own study, I will also post lecture notes and sample questions on eClass, and post my detailed lecture videos on YouTube. The links of my lecture videos will be posted on my website (<https://www.selcukozyurt.com/game-theory>). It is your responsibility to go over the materials. We will be discussing these materials during in-person lectures, and students’ active class participation is expected. For this reason, students are expected to come in-person lectures prepared. I don’t assign a fixed date or time for my office hours: Just e-mail me in advance to fix a date/time for virtual meeting over Zoom.

The course will consist of six quizzes and a final exam (cumulative), and the weights will be as follows:

Quizzes : 40%
Final (TBA) : 60%

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

All quizzes will have the same weight. The first two quizzes will be online. The other four quizzes and the final exam will be in-person. 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 calculation. Please use this policy wisely as an insurance against any unfortunate event that might cause you miss any quizzes.

Important Dates

Wednesday, Sept. 8 – Fall 2021 semester begins

Monday, Sept. 13 – Our first week

Monday, Sept. 20 – Quiz 1

Tuesday, Sept. 21 – Last day of ADD without permission

Monday, Oct. 4 – Quiz 2

Tuesday, Oct. 5 – Last day of ADD with permission

Monday, Oct. 11 – Holiday (Thanksgiving/ Reading week)

Monday, Oct. 25 – Quiz 3

Monday, Nov. 8 – Quiz 4

Friday, Nov. 12 – Last day of DROP

Monday, Nov. 22 – Quiz 5

Monday, Dec. 6 – Our last class

Monday, Dec. 6 – Quiz 6

Tuesday, Dec. 7 – Fall 2021 semester ends

Important Course Information

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>

- Senate Policy on Academic Honesty and the Academic Integrity Website
- Ethics Review Process for research involving human participants
- Course requirement accommodation for students with disabilities, including physical, medical, systemic, learning and psychiatric disabilities
- Student Conduct Standards
- Religious Observance Accommodation

Course Outline

WEEK 1 (September 13th)

TOPICS: MATHEMATICS AND LOGIC REVIEWS

1. Basic Concepts in Mathematics
2. Propositional Logic
3. Optimization
4. Probability
5. Topology

Week 2 (September 20th): Quiz 1 (Online – Week 1 & Week 2 materials)

TOPICS: UNCERTAINTY

1. Introduction to Uncertainty and Risk
2. Risk Preferences
3. Expected Utility Theory
4. Expected Utility Theory at Work: Numerical Examples

Week 3 (September 27th)

TOPICS: INTRODUCTION TO GAME THEORY

1. Introduction to Game Theory
2. Strategy in Games
3. Normal (Strategic) Form Representation of Games
4. Examples for Normal Form Representation
5. Beliefs & Mixed Strategies
6. General Assumptions and Methodology
7. Efficiency in Games

Week 4 (October 4th): Quiz 2 (Online – Week 3 & Week 4 materials)

TOPICS: BASIC SOLUTION CONCEPTS AND APPLICATIONS

1. Strategic Dominance
2. Best Response
3. Dominance versus Best response
4. Examples for Best Response and Strict Domination
5. Weak Dominance
6. Rationalizability & Iterated Elimination of Strictly Dominated Strategies (IESDS)
7. Applications for Rationalizability and IESDS

Week 5 (October 18th):

TOPICS: NASH EQUILIBRIUM

1. Nash Equilibrium: Why We Need?
2. Nash Equilibrium: Formal Definition and Intuition
3. Finding Pure Strategy Nash Equilibrium: Examples

Week 6 (October 25th): Quiz 3 (in class – Week 5 & Week 6 materials)

TOPICS: MIXED STRATEGY NASH EQUILIBRIUM

1. Mixed Strategy Nash Equilibrium
2. Mixed Strategy Nash Equilibrium, Strict Dominance, and Efficiency
3. Strictly Competitive Games, Security Strategies, and Maxmin Strategies

Week 7 (November 1st)

TOPICS: EXTENSIVE FORM GAMES WITH PERFECT INFORMATION

1. The Basics of Extensive Form Games
2. Nash Equilibrium in Extensive Games
3. Sequential Rationality and Backward Induction
4. Backward Induction, Subgame Perfect Nash Equilibrium & Nash Equilibrium
5. Examples for Subgame Perfect Nash Equilibrium
6. Extensive Games with infinitely Many Strategies: Stackelberg Duopoly

Week 8 (November 8th): Quiz 4 (in class – Week 7 & Week 8 materials)

TOPICS: EXTENSIVE FORM GAMES WITH IMPERFECT INFORMATION

1. Subgame Perfection for Extensive Form Games with Imperfect Information
2. One Deviation Property: A Generalization of Backward Induction
3. Applications

Week 9 (November 15th)

TOPICS: INTRODUCTION TO REPEATED GAMES

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
5. Infinitely Repeated Games and Folk Theorem
6. Tit for Tat Strategies and Infinitely Repeated Prisoners' Dilemma

Week 10 (November 22nd): Quiz 5 (in class – Week 9 & Week 10 materials)

TOPICS: BAYESIAN NASH EQUILIBRIUM

1. Introduction to Bayesian Games
2. Bayesian Games and Bayesian Nash Equilibrium
3. Examples for Bayesian Nash Equilibrium

Week 11 (November 29th):

TOPICS: PERFECT BAYESIAN (NASH) EQUILIBRIUM

1. Extensive form games with Incomplete Information
2. Strategies in Extensive Form Games with Incomplete Information
3. Strategic Form Representation of Sequential Games with Incomplete Information
4. Subgame Perfection in Extensive Form Games with Incomplete Information
5. Perfect Bayesian Equilibrium: Requirements 1 - 4
6. How to Solve for Perfect Bayesian Equilibrium: Examples
7. Signaling Games

Week 12 (December 6th): Quiz 6 (in class – Week 11 & Week 12 materials)

TOPICS: PRINCIPAL – AGENT MODELS

1. Introduction to Moral Hazard and Adverse Selection
2. Hidden Information: Fundamentals of Principal - Agent Models
3. Hidden Information (Screening Problem)