УКРАЇНСЬКО-АМЕРИКАНСЬКИЙ УНІВЕРСИТЕТ КОНКОРДІЯ

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Game Theory
Syllabus
ПП 2.12
PHD 647
Specialty: 051 "Economics"
Educational program "Economics"

Quarter/Year: <u>Fall/2023</u>   ECTS Credits: 3
Instructor: Olena Zhytkevych, PhD   US Credits: 1,5
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Chat on Moodle

Prerequisites: -

Course Description

This an introduction course to the non-cooperative and cooperative applications which are covered across fields including economics, financial economics, management and marketing.

The aim of this course is to provide PhD students with a framework for understanding and evaluating different game models of decision-making and strategic interactions between organizations, which can be utilized in their dissertations and further publications. The course starts with an overview of the game theory and its main principles then presents models of decision-making for organizations and their interactions. The course's applications include cooperation and conflict, entry deterrence, financial markets, etc.

Hence, students will have an opportunity to critically discuss existing models, practice and run their own experiments by implementing game theory principles.

Course Outcomes

 Upon successful completion of this course, students will be able to:

PH01. Advanced conceptual and methodological knowledge of economics, management of socio-economic systems, and the borders of subject industries, as well as research skills that are sufficient for carrying out fundamental and applied research on levels of world achievements in the relevant areas.

PH02. Deep understanding of basic (fundamental) principles and methods of economic sciences, as well as the methodology of scientific research, to create new knowledge in the sphere of an economy with the purpose achievement economic and social development in conditions of globalization.

PH03. Elaborate and explore fundamental and applied models of socio-economic processes and systems, effectively using them for obtaining new knowledge and/or creating innovative products in the economy and tangential interdisciplinary directions.

PH04. Apply modern tools and technologies of search, processing, and information analysis, in particular, statistical methods of analysis of large arrays of data and/or complex structures, specialized software, and informative systems.

PH05. Propose new solutions, develop scientific projects that give the possibility of rethinking and creating new integral knowledge and/or professional practice, solve significant and fundamental problems in economic science, taking into account social, economic, and environmental issues and legal aspects; provide commercialization results based on scientific research and compliance rights to intellectual property.

PH06. Free to present and discuss with specialists and non-specialists the results of research, theoretical and practical problems economic state, and in foreign languages, qualified to display the results of research in scientific publications in leading scientific editions.

PH07. Apply innovative scientific and pedagogical technology to formulate the content, learning goals, ways to achieve them, forms of control, and carry responsibility through an efficient educational process with compliance norms for academic ethics and integrity.

Competencies

3K01. Ability to abstract thinking, analysis, and synthesis.

3K02. Ability to search, process and analyze information from different sources.

3K04. Ability to generate new ideas (creativity).

CK01. Ability to perform original research, and achieve scientific results that create new knowledge in economics and related interdisciplinary areas and can be published in leading scientific publications in economics and related fields.

CK03. Ability to use modern methodologies, methods, and tools of empirical and theoretical research in the field of economics, computer modeling methods, modern digital technologies, databases, and other electronic resources, and specialized software in scientific and scientific-pedagogical activities.

CK05. Ability to identify, conduct in-depth analysis, and solve problems of a research nature in the field of economics, taking into account economic risks and possible socio-economic consequences, and to evaluate and ensure the quality of performed research, including issues of European and Euro-Atlantic integration

Internationality: The course aims to familiarize students with basic game theory tools that are used broadly in modern microeconomic theory and finance at national and international levels. It covers simultaneous, sequential-move games, followed by an analysis of the repeated Prisoners' Dilemma game.

Communications

For individual issues, students should contact the professor ONLY by given e-mail or by Moodle. In the Subject line they should put: UACUFirstNameLastName. E-mail messages will normally be answered within 24 hours.

Note! Only emails sent from the student's corporate email address will be answered.

Attention! Official and only language used for assessment activities is English. Official and only languages used for communication within the University are Ukrainian and English.

Student Responsibilities

Time Commitment

The study of technical courses is cumulative (i.e., an understanding of earlier material is necessary to grasp concepts covered later). Past experience has shown a high correlation between procrastination and low grades. Students must be committed to completing tasks on time.

Technical Aspects

The student is obliged to provide himself/herself with all the necessary technical equipment for the educational process (laptop or computer, webcam, headsets or headphones and microphone), as well as access to the Internet.
Only students signed-in with their own first and last name are allowed into video lectures in Zoom.

Grading Policy

The course is based on mastery of course outcomes. Student grades for this course will be calculated based on performance.
Note: the minimal grade to pass a subject is 70%.

Graduate Grading Guidelines

The assignment of a letter grade for a course is an indication of the student's overall success in achieving the learning outcomes for the course. The course letter grade may be viewed as a summary statement of the student's achievement in individual assessments (assignments & activities). These assessments are intended to identify for students their strengths as well as those areas in need of improvement. Student work is assessed according to the guidelines below.

Course-level Grading guidelines:

Grade	ECTS Grade	International Grade
90% - 100%	A	5 (Excellent)
83% - 89%	B	4 (Very Good)
75% - 82%	C	4 (Good)
70% - 74%	D	3 (Good)
60% - 69%	E	3 (Acceptable)
35% - 59%	FX	Not acceptable, possible repetition of course

Criteria for grading:

ECTS grade	Requirements for the student
A	The student demonstrated a comprehensive systemic and in-depth knowledge of program material; processed basic and additional literature; obtained a solid grasp of the conceptual apparatus, methods, techniques and tools provided by the program; found creative abilities in the presentation of the educational program material both on this

	issue and on related modules of the course and related courses, or the student had a current control of 90-100 points	
B	The student demonstrated good knowledge of program material; processed the basic literature, mastered the conceptual apparatus, methods, techniques and tools provided by the program, but with some inaccuracies	
C		
D	The student showed mediocre knowledge of the core program material; learned information mainly from a lecture course or just one textbook; mastered only certain methods, techniques and tools provided by the program	
E		
FX	The student has significant gaps in knowledge of the main program material; fragmentary mastered the basic concepts, techniques and tools; significant mistakes are made when using them	

Maximum total possible points – 100 points incl. (Midterm and Final exam are 60% of overall evaluation, where Midterm – 20% and Final – 40%)
· Assignments / Projects – 40 points (several times during the course)
· Midterm exam – 20 points
· Final exam – 40 points

Student Workload
It is assumed that for each out of 14 class sessions a student spends about 10.5 academic hours of work. This includes 3.5 academic hours of lectures with the instructor and 7 academic hours of personal work. Personal work includes essential readings, practicing on problems at the end of each chapter, assignments, additional research for deeper knowledge and mastering the topics.
Please pay attention that 1 academic hour equals to 40 minutes.

Assignment Format
• All work should be shown in time. If the student misses the deadline – the task is failed.
• Midterm covered topics from previous lectures (weeks 1-6). It included multiple choice questions and cases (essays) and took about 1 hour.
• The Final exam covered all course material and included multiple choice questions and cases (essays). It lasts for 1 hour. Admission to the Final exam is possible only if all the tasks of the curriculum are covered.
• After the Midterm and Final is graded a student has access to the grade only. Access to the attempt, corrects answers and information whether the answer is correct cannot be granted.

Academic dishonesty
· Academic integrity is submitting one's own work and properly acknowledging the contributions of others. Forms of academic dishonesty include:
1.   Plagiarism — submitting all or part of another's work as one's own in an academic exercise such as an examination, a computer program, or written assignment.
2.   Cheating — using or attempting to use unauthorized materials on an examination or assignment, such as using unauthorized texts or notes or improperly obtaining (or attempting to obtain) copies of an examination or answers to an examination. Including the

use of artificial intelligence and pre-prepared answers to the questions of tasks is prohibited (unless otherwise specified in the task itself or allowed by the instructor).

3. Facilitating Academic Dishonesty — helping another commit an act of dishonesty, such as substituting for an examination or completing an assignment for someone else.

4. Fabrication — altering or transmitting, without authorization, academic information or records.

· Any violation of these rules constitutes academic dishonesty and is liable to result in a failing grade and disciplinary action. In case of any academic dishonesty a student is not allowed to continue or retake the assessment activity and for the Final the unsatisfactory grade ("0") is assigned for the course total. Cases of the academic dishonesty are not considered by the Academic Council.

· Midterm and Final are valid only if they are taken on-campus (room defined by the dean's office) and on UACU's computer/laptop or online on the student's computer/laptop using Zoom and other conditions defined by the dean's office to avoid the cases of academic dishonesty. Students who will not meet this requirement will be expelled from the course with grade "0".

· In case of missed Midterm or Final exam (for a valid reason like sickness or an emergency) a request to repeat the exam is possible. Permit to repeat a midterm or final exam is done through a letter to the dean's office with request and approval of subject lecturer.

· Submission or retaking of any assessment activities after deadlines are forbidden.

Submission & Return Policy

Assignments must be submitted to the professor on or before the due date indicated in the Course Schedule. The assignments submitted after the due dates receive zero points.

**** NO MAKE –UP QUIZZES AND EXAMS ****

Schedule

Week #	Research Projects	Assignments Due	Points
Lecture 1	Introduction to the course and Strategic Reasoning: - Basic concepts; - Constructing Game.	Essential reading: Source 1: Chapter 1&2, Source 2: Chapter 2-3	-
Lecture 2	Dominance solvable games: - Dominance and best response; - Solving a Game when Players Are Rational and Players Know that Players; - Are Rational; - Solving a Game when Rationality Is Common Knowledge; - Rationalizability and Iterated dominance.	ssential reading: Source 1: Chapter 3 Source 2: Chapter 4-7	-

Lecture 3	**Pure strategy Nash equilibrium** - Defining Nash Equilibrium ; - Classic Two-Player Games ; - The Best-Reply Method; - Three-Player Games.	Essential reading: Source 3: Chapter 12 (306-316pp) Source 1: Chapter 4 Recommended readings: Source 4: Chapter 5 (178-182pp) Source 5: Chapter 13 (449-458pp)	
Lecture 4	**Applications: Pure strategy Nash equilibrium** **Case study:** Game Theory: The Developer's Dilemma, Boeing vs. Airbus by Martin Kretschmer	**Essential reading:** Kretschmer, M. (1998). Game Theory: The Developer's Dilemma, Boeing vs. Airbus. *Strategy+Business*. https://www.strategy-business.com/article/15872 **Watch videos:** 1. Economics Design. (2020, July 19). *Airbus VS Boeing: A Game Theory Analysis (1/2)* [Video]. YouTube. 2. Economics Design. (2020b, July 26). *Airbus VS Boeing: A Game Theory Analysis (2/2)* [Video]. YouTube. **Assignment 1**	
			8
Lecture 5	**Mixed strategy Nash equilibrium**	Essential reading: Source 3: Chapter 12 (316-324pp) Source 4: Chapter 5 (184-192pp) Source 5: Chapter 13 (460-462pp) Source 1: Chapter 7 (226-249pp) Source 2: Chapter 11 **Recommended reading:**	
Lecture 6	**Applications: Mixed strategy Nash equilibrium**	Essential reading: Video: Palacios-Huerta, I. *Beautiful Game Theory, Beautiful Economics* [Video]. TED Talks. https://www.ted.com/talk	

		 Assignment 2 **Source 6, pages 98-108.** **1. Exercise 4**—Finding a Mixed Strategy Nash Equilibrium in the Unemployment Benefits Game, page 98-100. **2. Exercise 5**—Newlyweds Buying an Apartment Game, page 100-104. **3. Exercise 6**—Finding Mixed Strategies in the Hawk-Dove Game, page 104-108. **Recommended reading:** Source 2: Chapter 16	**8**
Lecture 7	**Midterm**		**20**
Lecture 8	**Zero-sum games and applications**	Essential reading: Chapter 2 Two-Person Zero-Sum Games https://nordstrommath.com/Intro GameTheory/chapter-2.html Instructor's notes with mentioned references Assignment 3	**8**
Lecture 9&10	**Extensive form games and subgame perfect equilibrium** - Sequential Games with Perfect Information - Backward Induction and Subgame - Perfect Nash Equilibrium - Examples	Essential reading: Source 1: Chapter 8-9 Source 3: Chapter 18-19 (303-339pp Source 4: Chapter 5 (192-202pp) Source 5: Chapter 13 (463-470pp) **Recommended reading:**	
Lecture 11	**Applications of extensive form games**	Essential readings: Source 6, pages 156-159, 172-174, 192-194 1. Exercise 2—Entry-Predation Game, pages 156-159 2. Exercise 7—Electoral Competition, pages 172-174 Assignment 4	

		3. Exercise 14—First- and Second-Mover Advantage in Product Differentiation, pages 192-194	**8**
Lecture 12&13	**Infinitely repeated games and its applications**	Essential reading: Chapter 3 Repeated Two-Person Zero-sum Games https://nordstrommath.com/Intro GameTheory/chapter-3.html Source 1: Chapter 13 Source 2: Chapter 22 Recommended reading: Source 3: Chapter 23 Source 4: Chapter 5 (201-228pp) Assignment 5	**8**
Lecture 14	**Final - comprehensive exam**		**40**

Recommended Materials

Game Theory text book:
 Source 1: Games, Strategies and Decision Making. Joseph Harrington Jr. Worth Publishers. Second edition, 2014.
Source 2: Strategy. An Introduction to Game Theory. Joel Watson. Norton Publishing. 2nd edition. 2008.
 Game Theory and Microeconomics topics:
 Source 3: Intermediate Microeconomic Theory: Tools and Step-by-Step Examples, Ana Espinola-Arredondo and Felix Munoz-Garcia, The MIT Press, October 2020.
Source 4: Nicholson, W. and C. Snyder Intermediate Microeconomics and its Application. 12th edition, Cengage Learning, 2015.
Source 5: Perloff, J.M. Microeconomics with Calculus. 3rd edition, Pearson Education, 2014.

Game Theory and Practicing:

Source 6: Strategy and Game Theory: Practice Exercises with Answers. Felix Munoz-Garcia and Daniel ToroGonzalez. Springer Verlag, 2nd edition, 2019.

Additional materials:
Introduction to Game Theory: a Discovery Approach (2020), Jennifer Firkins Nordstrom, McMinnville, Oregon
Access here *https://open.umn.edu/opentextbooks/textbooks/introduction-to-game-theory-a-discovery-approach*
Videos:
1. Economics Design. (2020, July 19). *Airbus VS Boeing: A Game Theory Analysis (1/2)* [Video]. YouTube.

2.   Economics Design. (2020b, July 26). *Airbus VS Boeing: A Game Theory Analysis (2/2)* [Video]. YouTube.

3.   Palacios-Huerta, I. (n.d.). *Beautiful Game Theory, Beautiful Economics* [Video]. TED Talks. https://www.ted.com/talks/ignacio_palacios_huerta_beautiful_game_theory_beautiful_economics

Movie: A beautiful mind, https://www.investopedia.com/terms/g/gametheory.asp applications: https://studiousguy.com/game-theory-examples-in-real-life/

Articles:

1.   Ghosh, Sujata & Heifetz, Aviad & Verbrugge, Rineke. (2016). Do players reason by forward induction in dynamic perfect information games?. Electronic Proceedings in Theoretical Computer Science. doi: 10.4204/EPTCS.215.12. https://www.researchgate.net/publication/304357852_Do_players_reason_by_forward_induction_in_dynamic_perfect_information_games/references

2.   Theory, G. (n.d.). What are some of the challenges and limitations of game theory in modeling real-world network phenomena? *www.linkedin.com*. https://www.linkedin.com/advice/1/what-some-challenges-limitations-game-theory-modeling?trackingId=7353%2FSv1AmmiuzzdstImbw%3D%3D&updateUrn=urn%3Ali%3Aactivity%3A7071926530372739072&trk=fv

3.   Abedian, M., Amindoust, A., Maddahi, R. and Jouzdani, J. (2022), "A game theory approach to selecting marketing-mix strategies", *Journal of Advances in Management Research*, Vol. 19 No. 1, pp. 139-158. https://doi.org/10.1108/JAMR-10-2020-0264

 4.   Dominici, Gandolfo. (2011). Game Theory as a Marketing Tool: Uses and Limitations. Elixir Journal. 3524-3528.

The above schedule and procedures are subject to change in the event of extenuating circumstances.

Протокол засідання кафедр № 4 від 22.08.2023 року

Проректор з навчально-методичної
роботи   Л.І.Кондратенко

Завідувач кафедри   Л.В.Жарова

Викладач   О.В.Житкевич