Course program and reading list

Semester 2 Year 2024

School: Lauder School of Government, Diplomacy & Strategy M.A

Game Theory

Lecturer:

Dr. Uri Resnick ruri@runi.ac.il

Course No.:	Course Type :	Weekly Hours :	Credit:
3447	Lecture	2	2

Course Requirements :	Group Code :	Language:
Final Paper	241344700	English

Course Description

The course introduces fundamental concepts in game theory as these pertain to international relations applications. An emphasis is placed on empirical examples and practical implications of the formal insights, rather than on in-depth mathematics. The course does not require prior mathematical knowledge beyond high school level algebra and probability. Students will however be required to make some use of formal notation.

Details: We will study the basics of utility theory and discuss the concept of rationality. We will study non-cooperative game models for the description of international decision making scenarios and prediction of conflict outcomes (looking at different solution concepts and types of equilibrium). We will explore the role of randomization in strategic situations and discuss rational behavior under conditions of uncertainty. We will study strategic and extensive form games and related solution concepts. We will be introduced to repeated games as a model for understanding the emergence of cooperation under conditions of international 'anarchy'. We will discuss the basics of cooperative game theory as it pertains to the analysis of coalition formation and behavior. We will focus specifically on the Shapley-Shubik power index as a means of analyzing the distribution of

power within committees such as the United Nations Security Council. We will study social choice theory, with a focus on Arrow's Impossibility Theorem in relation to inherent limitations on democracy, the democratic peace and the unitary actor assumption. We will discuss bargaining theory, with an emphasis on its relevance to international bargaining scenarios. We will study evolutionary models, in relation to constructivist approaches in IR, especially in regard to their relevance for understanding the development of international norms. We will introduce auction theory and look at related applications of truth inducing mechanism design, in particular as these pertain to collective action problems such as the 'tragedy of the commons' and global efforts to foster sustainable development.

Course Goals

To acquaint the students with basic concepts in game theory

To impart to the students the capability to apply game theory models to the analysis of international relations phenomena

To enable the students to construct and analyze applied game theory models

Grading

Final Exam - 100%

Learning Outcomes

Students will be conversent in the terminology employed in the applied game theory literature in international relations

Students will be able to construct and analyze simple game theory models as applied to IR phenomena

Lecturer Office Hours

By prior appointment

Teaching Assistant

None

Reading List

1. Introduction + Rationality in International Relations (Utility Theory)

- J. Morrow, 1994. *Game Theory for Political Scientists.* Princeton: Princeton Univ. Press; Chapter 1: Overview, pages 1-8; Chapter 2: Utility Theory, pages 16-34.
- R. Aumann, 1985. "What is game theory trying to accomplish?" in *Frontiers of Economics.* Oxford: Basil Blackwell, pages 28-76.
- A. Colman, 1995. *Game Theory & Its Applications in the Social and Biological Sciences.* London: Routledge; Chapter 1: Introduction, pages 3-14; Chapter 2: One-person games, pages 15-25.

2. Describing International Conflict (Games in Strategic and Extensive Form)

Morrow, 1994. *Game Theory for Political Scientists.* Princeton: Princeton Univ. Press; Chapter 3: Specifying a Game, pages 51-71.

3. Predicting Conflict Outcomes ('Value' and Nash Equilibrium)

Morrow, 1994. *Game Theory for Political Scientists.* Princeton: Princeton Univ. Press; Chapter 4: Classical Game Theory, pages 73-81; 91-92.

- A. Colman, 1995. *Game Theory & Its Applications in the Social and Biological Sciences* London: Routledge; Chapter 4: Two-person zero-sum games, pages 53-61.
- M. Osborne, 2004. *An Introduction to Game Theory.*NY: Oxford Univ. Press; Chapter 2: Nash Equilibrium: Theory, pages 21-31. QA 269 O78 2004 JMS reserves

4. Randomization in Interactive Situations (Mixed Strategies)

- J. Morrow, 1994. *Game Theory for Political Scientists.*Princeton: Princeton Univ. Press; Chapter 4: Classical Game Theory, pages 81-91.
- A. Colman, 1995. *Game Theory & Its Applications in the Social and Biological Sciences.* London: Routledge; Chapter 4: Two-person zero-sum games, pages 26-69.

Osborne, 2004. *An Introduction to Game Theory.* NY: Oxford Univ. Press; Chapter 4: Mixed Strategy Equilibrium, pages 99-108.

5. Uncertainty: Games with Incomplete Information

Morrow, 1994. *Game Theory for Political Scientists.* Princeton: Princeton Univ. Press; Chapter 6:Beliefs and Perfect Bayesian Equilibrium, pages 161-187; Chapter 8: Games of Limited Information, pages 219-222.

6. The Emergence of Cooperation under 'Anarchy' (Repeated Games)

- J. Morrow, 1994. *Game Theory for Political Scientists.* Princeton: Princeton Univ. Press; Chapter 9: Repeated Games, pages 260-279.

1984. Axelrod, 1984. *The Evolution of Cooperation*. New York: Basic Books, pages 3-26; 145-191

Axelrod and R. Keohane, 1985. "Achieving cooperation under anarchy." *World Politics* 38, pages 226-254.

Keohane, 1986. "Reciprocity in international relations." *International Organization* 40, pages 1-28.

- M. Osborne, 2004. *An Introduction to Game Theory.* NY: Oxford Univ. Press; Chapter 14: Repeated Games: The Prisoner's Dilemma, pages 419-431. QA 269 O78 2004 JMS reserves

- A. Colman, 1995. *Game Theory & Its Applications in the Social and Biological Sciences.* London: Routledge; Chapter 7 Experiments with Prisoner's Dilemma and related games, pages 144-149.

Wagner, 1983. "The Theory of Games and the Problem of International Cooperation." *American Political Science Review* 77: 330-346.

7. The Power of Members of Committees such as the Security Council (Shapley-Shubik Index)

- E.Y. Gura and M. Maschler, 2008. *Insights into Game Theory: An Alternative Mathematical Experience.* Cambridge: Cambridge University Press; Chapter 3: The Shapley Value in Cooperative Games, pages 97-165.

O'Neill, 1996. "Power and Satisfaction in the United Nations Security Council." *The Journal of Conflict Resolution* 40(2), pages 219-237.

8. The 'Democratic Peace' and the Limitations of Democracy (Arrow's Theorem)

- E.Y. Gura and M. Maschler, 2008. *Insights into Game Theory: An Alternative Mathematical Experience.* Cambridge: Cambridge University Press; Chapter 2: Social Justice, pages 59-64, 67-85, 87-92.

9. International Bargaining (the Nash Solution and Rubinstein's Model)

- J. Morrow, 1994. *Game Theory for Political Scientists.* Princeton: Princeton Univ. Press; Chapter 4: Classical Game Theory, pages 111-116; 145-149

- Osborne, 2004. *An Introduction to Game Theory.* NY: Oxford Univ. Press; Chapter 16: Bargaining, pages 481-488. QA 269 O78 2004 (reserve desk Main library) ; JOS on order

10. <u>Constructivism and Norms (Evolutionary Models)</u>

- H. Morgenthau,1973. *Politics Among Nations: The Struggle for Power and Peace*, Brief Edition. Boston, MA: McGraw Hill; Chapter 9: Elements of National Power, pages 143-151.

- A. Colman, 1995. *Game Theory & Its Applications in the Social and Biological Sciences.* London: Routledge; Chapter 11: Theory of evolution: strategic aspects, pages 272-293.

- Osborne, 2004. *An Introduction to Game Theory.* NY: Oxford Univ. Press; Chapter 13: Evolutionary Equilibrium: Theory, pages 393-417. QA 269 O78 2004 (reserve desk Main library) ; JOS on order

Resnick, 2013. *Dynamics of Asymmetric Territorial Conflict: The Evolution of Patience*. Basingstoke, UK: Palgrave-Macmillan; Chapter 4: Dynamics of Asymmetric Territorial Conflict: A Model, pages 173-190; 520-521, 550-552.