OR 607 GAME THEORY AND COMPETITIVE STRATEGIES
FALL 2023

Instructor: Özgen Karaer, IE 209, okaraer@metu.edu.tr

Course webpage: https://odtuclass.metu.edu.tr/

Course time and place: TBD

Course objective: To understand the basics of game theory and study its use in operations management problems. By the end of this course, the students will be able to
- Understand game theory concepts and assumptions
- Model a conflict with multiple agents using the game theory framework and find the solution as a prediction of the outcome
- Get familiarized with the use of game theory in the operations management literature, and understand concepts such as double marginalization, inefficiency due to lack of coordination (price of anarchy), competition & collaboration
- Present and evaluate theoretical work effectively

Course conduct: First 10-11 weeks of the semester will be lectures on game theory and equilibrium concepts. In the last 4-5 weeks, students will take the lead in presenting and discussing selected research papers (see below). Students are required to attend the class well prepared and are expected to actively participate in class discussions.

Textbook:
1. Gibbons, R., Game Theory for Applied Economists, Princeton: Princeton University Press, 1992.
2. Fudenberg, D. and J. Tirole, Game Theory, Cambridge: MIT Press, 1991.

Reference Material:
1. Mas-Colell, A., M. Whinston, and J. Green, Microeconomic Theory, Oxford University Press, 1995.

Background: Basic math and economics
Familiarity with OM problems and solution tools

Grading: Evaluation of students will be based on
- Class participation & quizzes (10%)
- Midterm (2) (20%, 40%)
- Paper presentations (12%)
- Research project (18%)

Course Outline: (NOTE: The selected papers are subject to change)
Week 1-2-3. Static Games of Complete Information
Week 4-5-6. Dynamic Games of Complete Information (and Midterm 1)
Week 7-8. Static Games of Incomplete Information
Week 9-10. Dynamic Games of Incomplete Information (and Midterm 2)

Week 11

Pasternack, B. A. 1985. Optimal pricing and returns policies for perishable commodities. *Marketing Science*, Vol. 4, pp.166-176. (no presentation)

    a. Cachon, G. and M. Lariviere, 2005. Supply Chain Coordination with Revenue-Sharing Contracts: Strengths and Limitations. *Management Science*, 51(1) 30-44.

    b. Ha, A.Y., Luo, H. and Shang, W., 2022. Supplier encroachment, information sharing, and channel structure in online retail platforms. Production and Operations Management, 31(3), pp.1235-1251.

Week 12.

    a. Esenduran, G., Lin, Y.T., Xiao, W. and Jin, M., 2020. Choice of electronic waste recycling standard under recovery channel competition. *Manufacturing & Service Operations Management*, 22(3), pp.495-512.

    b. Chen, Y. and Chen, F., 2019. On the Competition between Two Modes of Product Recovery: Remanufacturing and Refurbishing. *Production and Operations Management,* 28(12), pp.2983-3001.

Week 13.

    a. Bolandifar, E., Kouvelis, P. and Zhang, F., 2016. Delegation vs. control in supply chain procurement under competition. *Production and Operations Management*, 25(9), pp.1528-1541.

    b. Özer, Ö., Y. Zheng, and K. Chen. 2011. Trust in Forecast Information Sharing. *Management Science*, Vol. 57, pp. 1111-1137.

Week 14.

    a. Akkaya, D., Bimpikis, K. and Lee, H., 2021. Government interventions to promote agricultural innovation. *Manufacturing & Service Operations Management*, 23(2), pp.437-452.

    b. Huang, L., Song, J.S. and Swinney, R., 2022. Managing social responsibility in multitier supply chains. Manufacturing & Service Operations Management, 24(6), pp.2843-2862.

    c. Mu, L., Hu, B., Reddy, A.A. and Gavirneni, S., 2022. Negotiating government-to-government food importing contracts: A Nash bargaining framework. Manufacturing & Service Operations Management, 24(3), pp.1681-1697.

Additional Papers:

1. Cachon, G.P. and Lariviere, M.A., 1999. Capacity allocation using past sales: When to turn-and-earn. *Management science*, 45(5), pp.685-703.

2. Cohen-Vernik, D.A. and D. Purohit. 2014. Turn-and-Earn Incentives with a Product Line. *Management Science,* 60(2), pp.400-414.

3. Ha, A. Y., W. Shang, and Y. Wang. 2017. Manufacturer Rebate Competition in a Supply Chain with a Common Retailer. Production and Operations Management, 26(11), pp 2122-2136.

4. Hu, B., Mai, Y. and Pekeč, S., 2020. Managing innovation spillover in outsourcing. Production and Operations Management, 29(10), pp.2252-2267.

5. Kurtuluş, M. and L.B. Toktay. 2011. Category Captainship vs. Retailer Category Management under Limited Retail Shelf Space. *Production and Operations Management*, 20(1), pp.47-56.

6. Ha, A. Y., Q. Tian, and S. Tong. 2017. Information Sharing in Competing Supply Chains with Production Cost Reduction. *Manufacturing & Service Operations Management*, 19(2), pp 246-262.

7. Lee, D. and H. Mendelson. 2008. Divide and Conquer: Competing with Free Technology Under Network Effects. Production and Operations Management, 17(1), pp 12-28.

8. Caro, F., P. Chintapalli, K. Rajaram, and C. S. Tang. 2018. Improving Supplier Compliance through Joint and Shared Audits with Collective Penalty. *Manufacturing & Service Operations Management,* 20(2) 363-380.

Research project: Students are expected to submit a <u>project report</u> on a stream of literature (max. 8 pages). The report should contain <u>at least 7 published</u> articles related to the research stream.
For each paper, students are expected to
        1. describe the problem setting studied,
        2. list the research questions,
        3. summarize the main findings, and
        4. discuss contribution of the paper (to the literature) and its value to practice
The papers must be published in one of the following journals: Management Science, Operations Research, Manufacturing & Service Operations Management (MSOM), Production and Operations Management, European Journal of Operational Research, Journal of Operations Management.
The list of journals can be relaxed upon consultation with the instructor.
Students can also introduce a potential problem that can be studied. This problem should be relevant and should promise a contribution to the literature. This problem part is optional and will be considered as a *bonus* if submitted (will be evaluated out of 20pts in addition to the 100pts score for the report).
Note: The selected papers must be close enough in problem setting and research questions. Students may be inspired by a paper discussed in class. However, that paper is <u>not</u> counted in the 7 articles required in the project.

Presentations: Each week (for the last four/five weeks), two papers will be discussed. Each paper will be discussed by two students. Each paper presentation will last about 40 minutes.
Presentation requirements will be determined based on the total class size.