

Syllabus: EC 427, Advanced Game Theory

University of Oregon

Summer 2020

Instructor: Zachary A. Kiefer

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Online Lectures: Mon-Thurs, 10-11:50AM via Zoom

Online Office Hours: Mon-Thurs, 1:30-2:30 PM via Zoom

Course Website: Hosted on Canvas

Course Description: Game theory is a way of thinking about situations in which the outcome of the situation depends not just on what you decide to do, but on what other people decide to do. In this course, we will examine ways of modeling and analyzing these situations mathematically, with a focus on Nash Equilibrium and its refinements as a solution concept.

Zoom Lectures: Due to ongoing concerns over COVID-19, this course is being given online. I have chosen to give live online lectures during what would normally be our lecture time slot: these lectures (in addition to the slides used in them) will be posted to Canvas after the fact, but if you wish to ask me questions about the material I cover, I encourage you to attend the live lectures and ask them as they come up.

Textbook (Optional): My lectures will be based on *An Introduction to Game Theory* by Martin J. Osborne, published by Oxford University Press (ISBN 0-19-512895-8). The textbook will not be required for homework, but may be a useful secondary resource for review and further study.

Grades: Your grade for this course will be based on two exams, weekly homework assignments, and your participation in a practical, competitive exercise lasting for the entire class. The components of your grade will be weighted as follows:

| | |
|--------------------------|----------|
| Midterm Exam | 25% |
| Final Exam | 25% |
| Homework | 30% |
| Practical Exercises | 20% |
| Competitive Extra Credit | up to 5% |

Grading Scale: Letter grades will be assigned as follows:

| | | |
|-------------|------------------|-------------|
| | 93-100% → A | 90-92% → A- |
| 87-89% → B+ | 83-86% → B | 80-82% → B- |
| 77-79% → C+ | 73-76% → C | 70-72% → C- |
| 67-69% → D+ | 63-66% → D | 60-62% → D- |
| | 59% or below → F | |

Homework: Four homework assignments will be given over the course of the class, and the lowest score will be dropped. The homework will be administered using Canvas.

I actively encourage you to work in groups on this homework.

Exams: The midterm will be administered at the normal class time on Thursday, July 2, and the final exam will be administered during class on Thursday, July 16. The final will not technically be comprehensive, but concepts from the earlier half of the course will remain relevant for the later half of the course. A curve may be applied to each exam.

Because this course is being given online, both exams will be administered using Canvas. They will be open-book and open-note, and the difficulty will be set accordingly.

Make-Up Exam Policy: A make-up exam will be given in the case of documented serious illness or family emergency, and only if you inform me of your absence in writing earlier than 5PM on the day of the exam. You should be aware that make-up exams will have different questions than the original exam, and may therefore be more difficult.

Practical Exercises: Game theory is not entirely about games like Monopoly, Settlers of Catan, or Diplomacy—but there are certainly ways to apply it while playing! In lieu of the in-class exercises that I use when teaching this class in-person, part of your grade will be based on applying the concepts from this class to actual games that you may already be familiar with. There will be a weekly activity due each Friday on Canvas, with the following parts:

- Play a turn-based game (preferably online, in the name of social distancing). The next page has a list of board and card games you can play free and online, but if you have another in mind, contact me and we'll discuss it.
- I encourage you to get together with classmates and play against each other, but it is also acceptable to play against strangers online (most of the suggested games have match-making features).
- Play as many times as you feel you need to understand the rules and the strategy of the game. I will provide suggested topics to address each week, but you do not need to restrict yourself to this list.
- Submit, on Canvas, a screenshot or photo of the final state of the game, and a short (150-300 word) explanation of how you could (or did) apply the week's course material to help win the game.
- You may use the same game for multiple weeks' activities, as long as you provide valid insights into how each week's material applies to the game.

Competitive Extra Credit: You can also receive extra credit by doing extra steps in the practical exercise:

- You will need to play **against other students in the class, in a group of 3-6**. When you submit your screenshot and analysis, you must tell me that you were playing for extra credit, and include the names of the classmates you played against.
- **The screenshot you submit must include a final score or other ranking.**
- **You must tell me which player you were in the screenshot so I can read the ranking.** This is especially important if you played under a username which is not your real name.
- **You may only receive extra credit once per game.** To get extra credit each week of the course, you will need to play and analyze four different games.
- Your extra credit will be based on your ranking at the end of the game (i.e. you will receive more extra credit for winning). As long as you submit everything described above, you will always receive **some** extra credit.

Suggested Online Games: Asterisk (*) indicates a game with simple rules, good for beginners who don't play many board games.

- **Chess*** (www.sparkchess.com, www.lichess.org, many other platforms)
- **Diplomacy*** (www.playdiplomacy.com)
- **Settlers of Catan*** (unofficial version at www.colonist.io)
- **Dominion** (www.dominion.games)
- **Games at www.tabletopia.com:**
 - **Santorini***
 - **Marrakech***
 - **Secret Hitler***
 - **Quartz**
 - **Terra Mystica**

As with the homework, the lowest score on the practical assignments will be dropped.

Tentative Schedule: Over the four weeks of the class, I plan to cover the following topics:

Week 1:

- Introduction, Syllabus, How to Succeed, What is Game Theory
- Strategic-Form Games, Dominance, Non-Rationalizability
- Best Responses, Nash Equilibrium
- Games with Many Players, Games with Continuous Strategies

Week 2:

- Extensive-Form Games, Converting to Strategic-Form, Supposition Methods
- Subgames, Backward Induction, Subgame-Perfect Nash Equilibrium
- *Extensive-Form Games with Continuous Strategies, Repeated Games*
- July 2: MIDTERM EXAM

Week 3:

- Expected-Utility Theory, States of Nature
- States of Nature with Continuous Strategies
- Mixed Strategies, Mixed Strategy Nash Equilibrium
- Graphical Methods for Finding Mixed Strategy Nash Equilibria

Week 4:

- Beliefs, Bayes' Rule, Bayesian Nash Equilibrium
- Signaling and Screening
- *Weak Perfect Bayesian Equilibrium*
- July 16: FINAL EXAM

Italicized topics are tentative and may be replaced due to time constraints or student interest.

Accessibility: The University of Oregon is working to create inclusive learning environments. Please notify me if there are aspects of the instruction or design of this course that result in disability-related barriers to your participation. You are also encouraged to contact the Accessible Education Center in 155 Oregon Hall at 541-346-1155 or uoaec@uoregon.edu.

Academic Integrity: Academic Misconduct: The University Student Conduct Code (available at conduct.uoregon.edu) defines academic misconduct. Students are prohibited from committing or attempting to commit any act that constitutes academic misconduct. By way of example, students should not give or receive (or attempt to give or receive) unauthorized help on assignments or examinations without express permission from the instructor. Students should properly acknowledge and document all sources of information (e.g. quotations, paraphrases, ideas) and use only the sources and resources authorized by the instructor. If there is any question about whether an act constitutes academic misconduct, it is the students' obligation to clarify the question with the instructor before committing or attempting to commit the act. Additional information about a common form of academic misconduct, plagiarism, is available at researchguides.uoregon.edu/citing-plagiarism. -From the Office of the Dean of Students

You are free to work with classmates on homework assignments, but if you choose to work with other students, your goal should be to gain a better understanding of the material covered by the homework, not simply to arrive at the answers. You may not work with other students on exams, or on any other graded assignment unless directed to do so.

Prohibited Discrimination and Harassment Reporting: Any student who has experienced sexual assault, relationship violence, sex or gender-based bullying, stalking, and/or sexual harassment may seek resources and help at safe.uoregon.edu. To get help by phone, a student can also call either the UO's 24-hour hotline at 541-346-7244 [SAFE], or the non-confidential Title IX Coordinator at 541-346-8136. From the SAFE website, students may also connect to Callisto, a confidential, third-party reporting site that is not a part of the university.

Students experiencing any other form of prohibited discrimination or harassment can find information at respect.uoregon.edu or aaeo.uoregon.edu or contact the non-confidential AAEO office at 541-346-3123 or the Dean of Students Office at 541-346-3216 for help. As UO policy has different reporting requirements based on the nature of the reported harassment or discrimination, additional information about reporting requirements for discrimination or harassment unrelated to sexual assault, relationship violence, sex or gender based bullying, stalking, and/or sexual harassment is available at Discrimination & Harassment.

Specific details about confidentiality of information and reporting obligations of employees can be found at titleix.uoregon.edu.

Mandatory Reporting of Child Abuse: UO employees, including faculty, staff, and GEs, are mandatory reporters of child abuse. This statement is to advise you that your disclosure of information about child abuse to a UO employee may trigger the UO employee's duty to report that information to the designated authorities.

Diversity: The University of Oregon is dedicated to the principles of equal opportunity and freedom from unfair discrimination for all members of the university community and an acceptance of true diversity as an affirmation of individual identity within a welcoming community. This course is committed to upholding these principles by encouraging the exploration, engagement, and expression of distinct perspectives and diverse identities.

All of us associated with the course—you included—are expected to value each class member's experiences and contributions and to communicate disagreements respectfully. Please notify me if you feel aspects of the course undermine these principles in any way. You may also notify the Department of Economics at 541-346-8845. For additional assistance and resources, you are also encouraged to contact the following campus services:

- Office of Equity and Inclusion: 1 Johnson Hall | 541-346-3175 | oied.uoregon.edu
- Center on Diversity and Community: 54 Susan Campbell Hall | 541-346-3212 | codac.uoregon.edu
- Bias Response Team: 164 Oregon Hall | 541-346-1134 | brt@uoregon.edu | bias.uoregon.edu