EC 327: Intro to Game Theory
(CRN – 31472)

Connor T. Wiegand

Spring 2024 (Apr 1 – Jun 16)

Class

MW 8:30 – 9:50 MCK 125

Instructor

Connor Wiegand (*wee-gand*)
MW after class --*til 11am*
& by appointment
cwiegand@uoregon.edu
PLC 508

GE

Boyoon Chang
Th 5:00–6:00 --*via zoom*[1]
& by appointment
bchang@uoregon.edu
PLC 525

Please note: The syllabus is a living document, and is subject to change at any time.

Course Description

This course is an introduction to game theory. Game theory involves the analysis of strategic situations; situations in which players choose strategies to obtain payoffs. For example consider the question "do I need to study hard for this course?" game theory tell us that if the grade is determined at least partially by your relative performance, then the answer is yes if all the other students study, but no if they don't. We will cover the key elements of classical game theory: representing games and strategies, the extensive form (which computer scientists call game trees), Bayesian games (games of imperfect information), repeated games, and more. We'll include a variety of examples including classic games and a few applications.

About Me

I am a fifth year PhD candidate here at the University of Oregon; my research includes experiments in game theory and novel elicitation and estimation of time preferences. I earned my double major in mathematics and economics from the University of Washington. My last name is pronounced *wee-gand*. Feel free to address me as "Connor", both in class and via email.

[1] See Canvas for details

Pre-reqs and Materials

Prerequisites

EC 201 or EC 101 is required for this course. MATH 111 (College Algebra > 5) is listed as "recommended" for taking EC 201. Personally, I think it should be a requirement, but I can compromise at "strongly recommended". I cannot imagine taking this course without a decent understanding of Algebra, but you have the right to try. If you have the time, I would recommend taking Algebra before this course. The exact same goes for EC 311 (Intermediate Micro): I strongly strongly strongly recommend that you take it before coming here. It will make your life easier and more enjoyable (and enhance the amount you can get out of this course). If you felt comfortable with material either from a prior intermediate micro course, or from a college math course beyond algebra, don't get too hung up on this point.

As an aside, if you decide to take EC 311 (Intermediate Micro) in the future, I **implore**[2] you to take at least one quarter of calculus ahead of time.

Textbook and Required Materials

I'm not a big fan of economic textbooks in general – I think most of them suck. I've used Steve Tadelis's *Game Theory: An Introduction* and some of the examples are nice. Other versions of this course recommend the 5th edition of *Games of Strategy* by Dixit, Skeath, and McAdams, or the 4th edition by Dixit, Skeath, and Reiley. However, there are certainly differences between my presentation of the material as compared to this book. I may assign readings during the term, in the event that we do not have time in lecture for certain concepts. I think you can find any of the mentioned texts online if you are creative and/or risky enough.

Homework and non-testing assignments will be administered through Canvas.

Assignments and Grading

Attendance

Greatly appreciated and strongly recommended, but not required for a grade. If you are regularly attending class and happen to miss a day, feel free to email me if you want to ensure you didn't miss anything administrative or important. Most of such material should be available in the slides or on Canvas.

Homework

There will be 4 full homework assignments. Homeworks are designed with the intent that you spend time working through challenging problems, including the types of problems which may appear on test(s). The homework is to be turned in via Canvas, and it is always a good idea to **look at your submission before and after posting to make sure it is formatted appropriately.**

The homework is tentatively due at 11:59pm on select Sundays. For each homework assignment, there is a 24-hour grace window where you can submit the homework late without penalty. However, one condition with the grace period: neither I nor the grader will respond to homework questions during the grace window; if you have a question, it does not hurt to email – just don't expect a response.

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[2] *to beg someone earnestly or desperately to do something*

Late homework is accepted w/ penalty if it is received within 48 hours of the original due date, and assuming the solution key has not been posted. If it has been more than 24 hours after the grace period **or** the solution key was posted, I will not accept the homework. The late penalty is 25% for every 6 hours later than the grace period.

I will try to provide announcements both in person and via canvas reminding you when assignments are due. Please make sure you are keeping track of when homework is due, as **it is your responsibility to know when things are due and be up-to-date on class communications.**

On file types:

- **pdf or doc(x) preferred**
- jpeg or png accepted
- Google doc must be public, and is discouraged
- .heic is not allowed
- Use a standard file formatting, such as one above. Do not use apple-exclusive file formats. Check with the grader if you are unsure or want to talk about submission options.

Project

There will be a project due on the Friday before finals week. There are two options for the project.

Option 1 (Standard)

In short, the project will involve describing an application of game theory in the world that interests you. Using this idea, you will think about how to model this interaction, how much researchers have though about modeling this question, and thinking of the policy implications that arise from modeling this interaction in this way. This will culminate in a brief (1 – 3 page) summary of your findings.

Details available later in the term.

Option 2

This option is an alternative to the standard project described above. There is a new type-setting language called **Typst**, which aims to be faster, at least as powerful, and easier to learn than it's alternative(s) (LaTeX). Currently, typsetting game theory is fairly inconvenient; there is one workhorse package for standard use-cases, but it is hard to justify the investment time to learn the syntax, even if one is already accustomed to TeX.

For this option, I want you to first typeset your homework for the term in Typst. The credit for the project portion comes from contributing to Typst as a tool for game theorists. This can accomplished in a number of manners. In it's simpliest form, I imagine a 1-3 page write-up containing some key pros and cons of using Typst for game theory, some functions or macros that you defined to work on the homework, and descirptions/limitations for said macros. If you want to go above and beyond, contribution can also be accomplished via, e.g., a package or github repository.

This is not a course in Typst, and so the responsibility of learning the language is up to you. That being said, I would be more than happy to meet outside of class at greater flexibility to help with learning this new langauage. Of course, standard homework due dates and poilicies still apply.

Please reach out early in the term if this project is of interest to you.

Exams

Dates

The midterm is tentatively scheduled for **Wednesday, May 08** in class. More details to come as we get closer to this date. Let me know in the first week if you have any qualms with this. The final exam is scheduled for **Monday, June 10th** at **10:15am**. The exam is scheduled in the **same room that we meet in for lecture**, but it is scheduled for 2 hours – longer than our normal class time.

Policies

Both exams will be closed note and are to be worked on individually. Questions and answers are not to be discussed with classmates, other individuals, or the shared on the internet. More info on exam policies will be coming prior to each exam, so make sure to come to class and/or check canvas for these policies. Here is a short list to get you started:

- You are required to bring your UO ID card and a pencil.
- You are allowed a calculator. Graphing calculators are okay, but anything with internet connectivity is not allowed. Using a calculator to solve algebraic equations is prohibited, and you are required to show all work.
- You are allowed a ruler or straight-edge to assist in graphing.
- Cell phones, earbuds/headphones, tablets, smart watches, and other devices that extend beyond the common and/or approved notion of a calculator are NOT allowed.
- If you wear a hat, please turn it around. Be mindful that we may ask you to pull your hair or hat up at any time during the test.

I try to be as accommodating as I can with legitimate excuses, but if you get sick on or just before the day of the exam, let me know **as soon as possible**. The more information/proof you can give me, the easier it will be to come up with a fair solution. Regardless, if you encounter even a legitimate reason to miss the original exam, expect your makeup to be slightly yet noticeably more challenging.

Grading Policy

Spirit

A general rule that the grader will follow, and that I will reference from time to time, is "does this work clearly communicate that the student understands the concept, and that the work they have shown is their own". If you are wondering what sort of work is appropriate or necessary when doing a problem, keep this sentiment in mind. At times, there will be diagrams in which minimal work is necessary. Other times, you will have algebra to do. Words that justify your math and reasoning are essential to writing down game theory solutions: math and drawings alone are not always clear or proof that work is your own. Following the above sentiment will hopefully serve as a good guide to what work is appropriate, but actual allotment of points is at the grader's discretion.

Cleanliness

Based on the above guideline, the the grader may deduct points if your work is overly disorganized or messy. This is at the grader's discretion, but is based on your responsibility to *clearly* present your understanding of the material. However, this principle is not all negative: if the grader feels that your work goes above and beyond in terms of clarity and displayed thinking, they are allowed to award extra points on the assignment. These points can only recover points missed elsewhere in the assignment, and will not accumulate into extra credit unless otherwise stated.

Do not expect these points to show up in either direction on any of your assignments. They are reserved for extreme cases, and the grader may never have to use them. Most of you shouldn't even be worrying about them. Once again, these are at the grader's discretion[3].

Breakdown

The grading breakdown is as follows:

Task	**Percent**
Homework	22.5%
Project	12.5%
Midterm	30%
Final exam	35%

The class is curved, so your particular percentage score does not reflect your actual grade. Instead, your letter grade will be determined by your performance relative to the distribution in the class.

Please note that the Economics Department requires a letter grade of C- or higher for all classes to count towards your degree. If you take this class P/NP, it will not be counted toward your major or minor requirements.

Percentages and grading policies are subject to change, as is everything in this syllabus.

Cheating

It takes a lot of time to write and grade exams. In this course, this time and effort is done by graduate students who have dozens of other things to be working on. Exams take a lot of time and effort to *take*, on behalf of students. I cannot express how much extra time and energy is wasted by everyone involved in this course when someone cheats. I know what Chegg is, I know what CourseHero is, I know the "resources". Don't cheat in my class. If you are worried about your grade, talk to me. Since the class is curved, academic dishonesty directly hurts your fellow peers. For you to completely waste the time and efforts of those around you, who see on a regular basis, just so you can bring your grade up, is *sucky*.

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[3]While the justification of each of these policies is rooted in your ability to display your thinking clearly, these points may also be thought of as a classic economic incentive to respect your grader's time. However, these incentives are not the primary focus of the class, and are therefore only assigned in exceptional cases.

Tentative Schedule

The outlined schedule is tentative and subject to change. You should think of it more as a plan for where we are heading rather than a precise schedule. This is especially true beyond week 8 of the term.

Week 1, 04/01 – 04/05 : *Intro to Game Theory*

- Syllabus and Example Games
- What is a game?

Week 2, 04/08 – 04/12 : *Normal Form Games*

- Normal Form Games, Perfect Information, and Rationality
- Dominance
- Solution Concepts

Week 3, 04/15 – 04/19 : *Solution Concepts*

- Best Response Functions
- Nash Equilibria

Homework 1 due at 11:59pm on **Sunday, April 21**

Week 4, 04/22 – 04/26 : *Sequential Games*

- NE, continued
- Intro to Extensive Form Games

Week 5, 04/29 – 05/03 : *Sequential Games, cont.*

- SPNE
- Incomplete information
- Converting between extensive and normal form

Week 6, 05/06 – 05/10 : *Midterm*

- Catch-up
- Foreshadowing mixed strategies
- **Midterm Exam** in class on **Wednesday, May 08**

Homework 2 due at 11:59pm on **Sunday, May 05**

Week 7, 05/13 – 05/17 : *Repeated Games and Duopolistic Competition*

- Discounting & Repeated Games
- The Cournot Duopoly Model

Week 8, 05/20 – 05/24 : *Intro to MSNE*

- Finish up Cournot model

Homework 3 due at 11:59pm on **Monday, May 27**

Week 9, 05/27 – 05/31 : *MSNE*

- Intro to finding MSNE

Week 10, 06/03 – 06/07 : *MSNE*

- Continue Mixed Strategies
- Finish MSNE

Homework 4 due at 11:59pm on **Friday, June 07**

Finals Week, 06/10 – 06/14

Final Exam at **10:15am** on **Monday, June 10th**

Project due at **11:59pm** on **Tuesday, June 11**

Learning Objectives

The following list is not comprehensive. Students will:

- Be able to define a game, and identify it's components
- Know the roles that information and rationality play in a game
- Understand the relationship between normal form and extensive games
- Be able to define various kinds of Nash Equilibria
- Be able to correctly solve for various kinds of Nash Equilibria
- Demonstrate understanding of key mechanisms of a game, and key mechanisms to solve a game, with examples including strict/weak dominance, backward induction, infinitely repeated strategies, information sets, and more

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Course Policies

Academic Integrity and Honesty

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.

Accommodations for Disabilities

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 (https://aec.uoregon.edu) in 360 Oregon Hall at 541-346-1155 or uoaec@uoregon.edu.

Fair Treatment

It is the policy of the university to maintain an environment free of harassment and discrimination against any person because of: age, race, color, ancestry, national or ethnic origin, religion, gender, disability, service in the uniformed services (as defined in state and federal law), the use of leave protected by state or federal law, veteran status, sex, sexual orientation, gender identity, perceived gender, marital or family status, pregnancy-related conditions, or genetic information.

Grade Disputes

Please do not e-mail me and ask for a higher grade unless you have a legitimate concern about how a particular assignment was graded. Changing grades just because someone e-mailed is unfair to everyone else in the class, so I will reject any such requests. If you do have a concern with how a particular assignment was graded, I reserve the right to re-grade the entire assignment, not just the portion being disputed.

Covid Syllabus Statement

Academic Disruption

In the event of a campus emergency that disrupts academic activities, course requirements, deadlines, and grading percentages are subject to change. Information about changes in this course will be communicated as soon as possible by email, and on Canvas. If we are not able to meet face-to-face, students should immediately log onto Canvas and read any announcements and/or access alternative assignments. Students are also expected to continue coursework as outlined in this syllabus or other instructions on Canvas.

In the event that the instructor of this course has to quarantine, this course may be taught online during that time.

COVID Containment Plan for Classes

As the University of Oregon returns to in-person instruction, the key to keeping our community healthy and safe involves prevention, containment, and support. Here is information critical to how the UO is responding to COVID-19.

Prevention: To prevent or reduce the spread of COVID-19 in classrooms and on campus, all students and employees must: Comply with vaccination policy Wear face coverings in all indoor spaces on UO campus Complete weekly testing if not fully vaccinated or exempted Wash hands frequently and practice social distancing when possible Complete daily self-checks Stay home/do not come to campus if feeling symptomatic Complete the UO COVID-19 case and contact reporting form if you test positive or have been in close contact with a confirmed or presumptive case.

Containment: If a student in class tests positive for COVID-19, all relevant classes will be notified via an email by the Corona Corps Care Team with instructions for students and staff based on their vaccination status. Specifically: Vaccinated and Asymptomatic students: Quarantine not required, but daily self-monitoring before coming on campus is advised; sign up for testing through MAP 3-5 days after exposure if advised you are a contact." Unvaccinated or partially vaccinated students: 14-day quarantine advised – do not come to class – and sign up for testing 3-5 days after notification through MAP, if asymptomatic, or through University Health Services (541-346-2770) or your primary care provider, if symptomatic. Symptomatic students: stay home (do not come to class/campus), complete the online case and contact form, and contact University Health Services (541-346-2770) or your primary care provide to arrange for immediate COVID-19 testing. Students identified as a close contacts of a positive case will be contacted by the Corona Corps Care Team (541-346-2292).

Support: The following resources are available to you as a student. University Health Services or call (541) 346-2770 University Counseling Center or call (541) 346-3277 or (541) 346-3227 (after hrs.) MAP Covid-19 Testing Corona Corps or call (541) 346-2292 Academic Advising or call (541) 346-3211 Dean of Students or call (541)-346-3216 Good Classroom Citizenship

Wear your mask and make sure it fits you well. Stay home if you're sick. Get to know your neighbors in class, and let them know if you test positive. Get tested regularly. Watch for signs and symptoms with the daily symptom self-check. Wash your hands frequently or use hand sanitizer. Complete the UO COVID-19 case and contact reporting form if you test positive or are a close contact of someone who tests positive.

Other Resources

Majoring in economics

Frequently asked questions about the major and advising within the major: https://economics.uoregon.edu/undergraduate-studies/advising-frequently-asked-questions/

Study skills

Reading the textbook more than once is likely a bad investment in your time. Frequently testing yourself on material is a better strategy (e.g. solve problems on Launchpad or at the back of the book rather than re-reading.)

The library has a variety of resources to help you develop the study skills needed to be successful. You can find some of these resources here: https://researchguides.uoregon.edu/student-success

Counseling Services

UO Counseling Services: For information, visit https://counseling.uoregon.edu/

UO Student After-Hour Support and Crisis Line: 541-346-3227