ECO316 H1F: Applied Game Theory

Department of Economics

University of Toronto

Fall 2022

Instructor: Stanton Hudja

Email: stanton.hudja@utoronto.ca (please use this email address instead of the Quercus messaging platform, which I do not check regularly)

Teaching Assistants: Yi-Tsung Hsieh and Aisha Hussain

Lectures: Monday 12-2 PM and Thursday 4-5 PM, SS2118

Instructor Office Hours: Wed 9:00am-11:00am, Max Gluskin House 254

TA Office Hours: Tues 1-2PM (Yi-Tsung), Online for now

1. Course Description

Game theory is a field of economics that provides mathematical tools to model and analyze strategic interactions between decisionmakers, such as consumers, firms, and governments. This course provides an introduction to game theory with particular emphasis on its "real-world" applications. We will learn some core concepts of game theory and use them to explain economic, social, and political phenomena. By the end of course, you will be able to

- Identify and classify the types of games
- Use appropriate tools to solve different forms of games
- Follow logical arguments and apply the strategic reasoning to analyze real life examples

2. Course Website

I will post lecture slides, problem sets, and announcements on Quercus. Please check it regularly.

3. Prerequisites

You must have taken one of ECO200Y1, ECO204Y1 or ECO206Y1 prior to taking this course. This course also uses basic calculus and probability theory (e.g., derivatives, integration and probability distributions).

You can take only one (NOT both) of ECO316 and ECO326.

- ECO316 and ECO326 are exclusions for each other – that means you cannot take both courses towards your degree.

- ECO316 cannot be counted towards any program that requires ECO326. In other words, if you need to take ECO326 for your program, you cannot take ECO316.

4. Optional Textbook

I will endeavour to keep the course self-contained: I will strive to make lecture slides thorough, and to provide plenty of practice problems (via problem sets, additional problems and sample exam questions). However, the course content is based on chapters from the following textbook:

An Introduction to Game Theory by Martin J. Osborne (Oxford University Press, New York, 2003), ISBN-13: 978-0195128956

If you so desire, you may refer to the textbook to read more on material covered in lectures, and to seek additional practice problems (although the problem set problems and other problems I post will likely be most similar to those that you will see on exams).

5. Evaluation

Your final grade will depend on **Problem Sets** (10%), **Class Participation (**10%), a **Midterm Exam** (35%) and a **Final Exam** (45%).

The **Problem Sets** (of which there are 10) are each worth 1% of your final course grade. Of these 10 assessments, the grades from the two assessments where you scored the lowest will be replaced with the two assessments that you scored the highest. The purpose of dropping the two lowest grades is to accommodate situations where a student is unable to complete a problem set for reasons beyond their control. As a result, no make-ups or extensions will be offered for problem sets.

The problem sets will be graded on a completion basis (0/1 = incomplete, 0.5/1 = attempted some problems, 1/1 = attempted all problems). They will be posted on Quercus and must be submitted via Quercus by 10am on the day they are due, after which solutions will be posted. Given that the problem sets are graded on a completion basis, and that the lowest two problem sets are dropped, late problem sets will not be accepted. If you are unable to fully complete a problem set prior to the deadline, submitting a partially-complete problem set will earn you at least partial points. You may collaborate with classmates on the problem sets, but you must submit them individually.

Class Participation will come in the form of participating in classroom experiments. The percentage of classroom experiments that you participate in is your grade. You are allowed to miss two classroom experiments without it affecting your class participation grade.

The **Midterm Exam** will take place on **October 20th** from **4PM– 6pm**. All material from the first six weeks is eligible to be covered on the midterm.

The **Final Exam** will take place during the final exam period scheduled by the university. It will be a 3-hour cumulative exam with an emphasis on material covered after the midterm.

6. Tutorials

Tutorials will take place immediately after lectures, in the same classroom. There will be no tutorial after the first lecture. In tutorials, I will address questions from the course for about 30 minutes.

7. Missed Term Work

- **a. Midterm:** The accommodation for missing the midterm is that the weight of the midterm will be shifted to the final exam. However, to qualify for this re-weighting, you must:
  - **i.** Record your absence through the online absence declaration tool on ACORN
  - **ii.** Email the course instructor no later than the start of the test and include your absence declaration as a receipt
- **b. Final exam:** If you miss the final exam, you can submit a petition to defer it. See more information on how to do so here: https://www.artsci.utoronto.ca/current/faculty-registrar/petitions/deferred-exams.

8. Regrading Policy

If you believe there has been an error in the grading of your exam, you may request a regrade. A regrade request form will open several days after grades have been returned and will close several days later. Regrade requests must be submitted prior to the form closing; late requests will not be accepted. Your request must include a detailed rationale for why more marks are merited, and while your request may be specific to a given question, the entire exam may be regraded and your grade can go up or down.

9. Religious Accommodation

As a student at the University of Toronto, you are part of a diverse community that welcomes and includes students and faculty from a wide range of backgrounds, cultural traditions, and spiritual beliefs. For my part, I will make every reasonable effort to avoid scheduling tests, examinations, or other compulsory activities on religious holy days not captured by statutory holidays. Further to University Policy, if you anticipate being absent from class or missing a major course activity (like a test, or in-class assignment) due to a religious observance, please let me know as early in the course as possible, and with sufficient notice (at least two to three weeks), so that we can work together to make alternate arrangements.

10. Learning Disability Accommodation Requirement

Students with diverse learning styles and needs are welcome in this course. If you have an acute or ongoing disability issue or accommodation need, you should register with Accessibility Services (AS) (accessibility.utoronto.ca) at the beginning of the academic year. Without registration, you will not be able to verify your situation with your instructors, and instructors will not be advised about your accommodation needs. AS will assess your medical situation, develop an accommodation plan with you, and support you in requesting accommodation for your course work. Remember that the process of accommodation is private: AS will not share details of your condition with any instructor, and your instructors will not reveal that you are registered with AS.

11. Academic Integrity

All students, faculty and staff are expected to follow the University's guidelines and policies on academic integrity. For students, this means following the standards of academic honesty when writing assignments, collaborating with fellow students, and writing tests and exams. Ensure that the work you submit for grading represents your own honest efforts. Plagiarism–representing someone else's work as your own or submitting work that you have previously submitted for marks in another class or program–is a serious offence that can result in sanctions. Speak to me or your TA for advice on anything that you find unclear. To learn more about how to cite and use source material appropriately and for other writing support, see the U of T writing support website at www.writing.utoronto.ca/. Consult the Code of Behaviour on Academic Matters for a complete outline of the University's policy and expectations. For more information, please see http://www.artsci.utoronto.ca/osai and http://academicintegrity.utoronto.ca/.

We are committed in providing the best learning experience possible and accommodate the needs of this difficult time, but at the same time we want to guarantee fairness in the evaluation. Therefore we will pursue at the full extent of UofT policies any case of infringement of the academic integrity guidelines.

12. Tentative Schedule

In the following schedule, IGT refers to Martin J. Osborne, An Introduction to Game Theory.

- Week 1: Strategic games and Nash equilibrium (IGT Chapter 1 and 2.1-2.7).
- Week 2: Examples of Nash equilibrium in games with many players. Competition between firms: the models of Bertrand and Cournot (IGT 3.2 and 3.1). Using best response functions to find Nash equilibria in general games (IGT 2.8).
- Week 3: Electoral competition (IGT 3.3).
- Week 4: Mixed strategy Nash equilibrium (IGT 4.1-4.3 and 4.5).
- Week 5: Applications of mixed strategy Nash equilibrium: expert diagnosis and the volunteer's dilemma (IGT 4.6 and 4.8).
- Week 6: Implications of rationality and beliefs about others' rationality; strict domination (IGT 2.9.1). Never -best responses. Iterated elimination of strictly dominated actions. Weak domination. (IGT 2.9; see also 12.2 and 12.3, although the treatment there is more advanced than the one in class.)
- Week 7: Midterm preparation class and midterm exam.
- Week 8: Auctions: private value sealed- bid auctions under first and second-price rules; common value auctions (IGT 9.6).
- Week 9: Extensive games: subgame perfect equilibrium (IGT 5.1 -5.5).

- Week 10: Reading Week
- Week 11: Extensive games: Stackelberg duopoly; ultimatum and holdup games (IGT 6.1, 6.2). 4
- Week 12: Repeated games and collusion (IGT 14.1 -14.12).
- Week 13: Extensive games with imperfect information; signaling games (IGT 10.1-10.5, 10.7).
- Week 14: Final preparation class or bonus class