

Tulane University
Department of Economics
ECON 4610 / 6610
Game Theory
Fall 2020

Professor: Patrick Testa

Course hours: Tuesdays and Thursdays, 10:55am-12:05pm

Course location: Stanley Thomas Hall 102

Office: ZOOM at tulane.zoom.us/j/2087148040

Office hours: Wednesdays, 3:00-5:00pm (please email to schedule an appointment)

Email: ptesta@tulane.edu

Office phone: (504) 865-5320

Overview

Game theory is the study of strategic interaction among rational individuals. The *strategic* nature of such interaction is rooted in the following idea: in order for rational individuals to optimize their choices in environments with other such individuals, they must take into account the potential actions of others, including how those actions might be influenced by said choices. This course will cover the essentials of game theory, including both its mathematical structure and its various applications in economics and other sciences, such as political science and biology. This course is intended for advanced undergraduate students and students in the master's program in economics. Students should have prior training in intermediate microeconomics and integral calculus (i.e. MATH 1210 or 1310). It is also helpful to have a background in basic probability theory, although it is not necessary.

Course goals and objectives

The goals of this course are:

- Expose students to the main ideas, methods, and real-world applications of game theory.
- Teach students how to formalize strategic situations as well-defined games.
- Introduce students to some of the strengths as well as limitations of game theoretic modeling for predicting real-world phenomena.

As a result of this course, students will be able to:

- Analyze problems in economics, politics, and other social contexts using game theoretic models.
- Develop their own basic game theoretic models to study strategic interaction in the real world.

Texts

Although there are no required texts, I recommend purchasing any of the following:

- Osborne, M. *An Introduction to Game Theory*. Oxford University Press.
- Pindyck, R. and D. Rubinfeld. *Microeconomics*. Pearson.
- Tadelis, S. *Game Theory: An Introduction*. Princeton University Press.
- Gibbons, R. *Game Theory for Applied Economists*. Princeton University Press
- Myerson, R. B. *Game Theory: Analysis of Conflict*. Harvard University Press.

For a more advanced text, see:

- Osborne and Rubinstein, *A Course in Game Theory*. MIT Press.
- Fudenberg and Tirole, *Game Theory*. MIT Press.

Attendance and COVID-19 policies

I will email each student asking that they arrive the first day at either 10:55 or 11:30am. These will henceforth be the **Tuesday** and **Thursday** groups. Students should attend class in person on their assigned day and take notes so that they are aware of assignments and deadlines as well as any scheduling changes that arise. Students should communicate to me via email if they will be absent and rely on office hours (please talk to me!) as well as help from peers to fill in any blanks. Midterm exams will be held online during normal class hours. Only a formal note from a doctor may qualify a student for a makeup exam. If a student must miss an exam otherwise, they may opt for the second grading plan below.

If it is not a student's assigned day; if a student cannot attend class due to actual or suspected exposure to COVID-19; or if there is an unexpected campus closure, students are expected to continue attending and participating in class virtually, except for in the event of serious illness, in which case documentation from the University Health Center will enable me to make additional accommodations. Lecture notes and audio will be recorded and streamed and/or posted on Canvas. Students may not post class recordings elsewhere, either wholly or in part. Please email me or schedule a ZOOM meeting for additional clarification or help.

Students must wear masks to, from, and during class at all times. In addition, students should remain a minimum of six feet apart during classes and exams. Failure to comply is a violation of the Code of Student Conduct and students will be subject to University discipline, which can include suspension or permanent dismissal. Please see tulane.edu/covid-19/health-strategies for University policies regarding COVID-19 testing and isolation.

Grades

Your grade will be based on either (i) five problem sets (25%), two midterm exams (20% each), and a cumulative final exam (35%), or (ii) five problem sets (25%) and the final exam (75%), whichever is greater. Students in the master's portion will be subject to different exams. Grades will follow the typical system ($\geq 93\%$ is A range, 90-92.5% is an A-, 87-89.5% is a B+, etc.).

ADA/Accessibility

Tulane University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability, please let me know immediately so that we can privately discuss options. I will never ask for medical documentation from you to support potential accommodation needs. Instead, to establish reasonable accommodations, I may request that you register with the Goldman Center for Student Accessibility. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. Goldman Center contact information: goldman@tulane.edu, accessibility.tulane.edu, or (504) 862-8433.

Code of academic conduct

The Code of Academic Conduct applies to all undergraduate students, full-time and part-time, in Tulane University. Tulane University expects and requires behavior compatible with its high standards of scholarship. By accepting admission to the university, a student accepts its regulations (i.e., Code of Academic Conduct and Code of Student Conduct) and acknowledges the right of the university to take disciplinary action, including suspension or expulsion, for conduct judged unsatisfactory or disruptive.

Religious accommodation policy

Per Tulane's religious accommodation policy, I will make every reasonable effort to ensure that students are able to observe religious holidays without jeopardizing their ability to fulfill their academic obligations. Excused absences do not relieve the student from the responsibility for any course work required during the period of absence. Students should notify me within the first two weeks of the semester about their intent to observe any holidays that fall on a class day or on the day of the final exam.

Course outline

Part I: Static games with perfect information

Introduction and troubleshooting tech enhancements

The rational choice approach to modeling behavior

Preference relations

Normal-form games

Dominance

Iterated deletion of dominated strategies

Best response

Pure strategy Nash equilibrium and Nash's existence theorem

Applications of Pure strategy Nash equilibrium

N -player discrete choice games and collective action

Mixed strategy Nash equilibrium

Applications of mixed strategy Nash equilibrium

Part II: Dynamic games with perfect information

Reviewing mathematical optimization

Continuous (static) games

Applications of N -player continuous games

Nash equilibrium and welfare optimality

Extensive-form games

Backward induction

Subgame perfect Nash equilibrium with discrete strategies

Subgame perfect equilibrium with continuous strategies

Economic applications of subgame perfect equilibrium

Bargaining

Repeated games, trigger strategies, and the evolution of cooperation

Part III: Games with relaxed information assumptions

Dynamic games with imperfect information

Incomplete information and Bayesian games

Bayesian Nash equilibrium

Perfect Bayesian equilibrium

Applications of Bayesian equilibria

Adverse selection

Signaling

Screening

Course schedule

Problem set I due (September 8)

Problem set II due (September 24)

Midterm exam I (September 24)

Problem set III due (October 13)

Problem set IV due (November 3)

Midterm exam II (November 3)

Problem set V due (November 24)

Thanksgiving break (November 26)

Final exam (December 2 at 4pm)

Note: dates and order of material may be subject to change.


Title IX

Tulane University recognizes the inherent dignity of all individuals and promotes respect for all people. As such, Tulane is committed to providing an environment free of all forms of discrimination including sexual and gender-based discrimination, harassment, and violence like sexual assault, intimate partner violence, and stalking. If you or someone you know has experienced or is experiencing these types of behaviors, know that you are not alone. Resources and support are available: you can learn more at <http://allin.tulane.edu>. Any and all of your communications on these matters will be treated as either “Confidential” or “Private” as explained in the chart below. Please know that if you choose to confide in me I am mandated by the university to report to the Title IX Coordinator, as Tulane and I want to be sure you are connected with all the support the university can offer. You do not need to respond to outreach from the university if you do not want. You can also make a report yourself, including an anonymous report, through the form at <http://tulane.edu/concerns>.

| Confidential | Private |
|---|---|
| <i>Except in extreme circumstances, involving imminent danger to one’s self or others, nothing will be shared without your explicit permission.</i> | <i>Conversations are kept as confidential as possible, but information is shared with key staff members so the University can offer resources and accommodations and take action if necessary for safety reasons.</i> |
| Counseling & Psychological Services (CAPS) (504) 314-2277 or The Line (24/7) (504) 264-6074 | Case Management & Victim Support Services (504) 314-2160 or orsrss@tulane.edu |
| Student Health Center (504) 865-5255 | Tulane University Police (TUPD) Uptown - (504) 865-5911. Downtown – (504) 988-5531 |
| Sexual Aggression Peer Hotline and Education (SAPHE) (504) 654-9543 | Title IX Coordinator (504) 314-2160 or msmith76@tulane.edu |

Emergency preparedness and response

| EMERGENCY NOTIFICATION SYSTEM: TU ALERT | RAVE GUARDIAN |
|---|--|
| <p>In the event of a campus emergency, Tulane University will notify students, faculty, and staff by email, text, and phone call. You were automatically enrolled in this system when you enrolled at the university.</p> <p>Check your contact information annually in Gibson Online to confirm its accuracy.</p> | <ul style="list-style-type: none"> • Download the RAVE Guardian app from the App Store • Communicate with dispatchers silently by selecting “Submit Tip” feature in the app • Use the Safety Timer feature to alert your “guardian” (TUPD, family, friend) when travelling alone at night <p>For more information, visit publicsafety.tulane.edu/rave-guardian</p> |
| <p>ACTIVE SHOOTER / VIOLENT ATTACKER</p> <ul style="list-style-type: none"> • RUN – run away from or avoid the affected area, if possible • HIDE – go into the nearest room that can be locked, turn out the lights, silence cell phones, and remain hidden until all-clear message is given through TU ALERT • FIGHT – do not attempt this option, except as a last resort <p>For more information on Active Shooter emergency procedures or to schedule a training, visit emergencyprep.tulane.edu</p> | <p>SEVERE WEATHER</p> <ul style="list-style-type: none"> • Follow all TU Alerts and outdoor warning sirens • Seek shelter indoors until the severe weather threat has passed and an all-clear message is given • Do not attempt to travel outside if weather is severe • Monitor the Tulane Emergency website (tulane.edu/emergency/) for university-wide closures during a severe weather event |



Tulane University
EMERGENCY PREPAREDNESS & RESPONSE