Economics 109: Game Theory (combined A00 and B00 classes)

Winter 2021, Professor Joel Watson

This course examines strategic situations, in which each agent's behavior generally affects the well-being of the other agents. Game theory is a technical framework for rigorously analyzing decision-making in such settings. Almost every type of interaction between living things is strategic. As social scientists, we focus on human interaction, and we shall assume that people behave in a rational, deliberate manner. In addition to exploring theory in the abstract, we will consider a variety of applications from economics, political science, and law.

Schedule: The topics covered in this course will be presented in a hybrid format, with flexible use of the class time and video lectures delivered separately on line. All classes meetings will take place remotely using Zoom. The meeting schedule follows.

- **Class meetings:** Tuesdays and Thursdays, 8:00 – 9:20 a.m. (class A00) and 9:30 – 10:50 a.m. (class B00) Pacific time. *Attendance is encouraged.*
  The Zoom meeting code for class A00 at 8:00 a.m. is:
  (Not shown for security)

- **Discussion sections:** Wednesdays 3:00 – 5:00 p.m. (B00) and Fridays 3:00 – 5:00 p.m. (A00). *Attendance is encouraged.*
  The Zoom meeting code for all discussion sections is:
  (Not shown for security)

- **Evening midterm examinations and final examination:** Tuesdays 1/12, 1/26, 2/9, 2/23 at 8:00 – 8:50 p.m., and Saturday 3/13 at 11:30 a.m. – 2:30 p.m. *Attendance is required for all students.*
  The Zoom meeting code for the exams is the same as that for the discussion sections:
  (Not shown for security)

Lectures will be recorded and posted on this Canvas site.

Attendance, Class Panels, and Participation: Students are encouraged to attend the class meetings. There will be no class meetings on university holidays. At each class meeting, a number of students (with a target of twelve) will be designated as "panel participants." Panel participants commit to a high level of participation during the class session. They must switch ON their video in Zoom (or make other arrangements with the instructor), be available to answer questions, take part in class examples, lead break-out sessions, and so on. Students are not required to be panel participants, but those who volunteer and perform well will receive "participation credit" (see below how this factors into grading). To select panel slots, students must place their names on this google sheet:
(Not shown for security)
Students are advised to select panel slots during the first week, before the slots fill.

Examinations: There will be four midterm examinations, a final examination, and additionally five short on-line substantial quizzes. A non-timed, easy self-check quiz will be posted for each chapter of the course as well. The midterm and final examinations will be proctored on

Zoom, with students locally recording themselves taking the exams and then uploading the recordings in canvas.

- The ***midterm exams*** will take place on the Tuesday evenings 1/12, 1/26, 2/9, 2/23 at 8:00 – 8:50 p.m. Students will be required to download/view the exam questions and submit their answers using both Gradescope (linked within Canvas) and Canvas, be present on Zoom with screen sharing and video on, record their Zoom sessions, and upload their Zoom recordings to Canvas.
- The ***final examination*** will comprise a take-home part and an interview part. The take-home part will be a set of problems distributed on Thursday 11 March 2021 at 2:00 p.m. Students must submit their answers on the Canvas and Gradescope course sites before 2:00 p.m. on 12 March 2021. The interview part will take place on Zoom during the scheduled final exam time. Not all students will be interviewed. Selections for interviews will be at the discretion of the instructor and TAs, based on (i) a random draw, (ii) preliminary grading of the take-home part, and (iii) whether interviews are needed for individual students due to problems with earlier exams and assignments. Each interview will be conducted privately by the instructor and TAs; the student will explain how to solved exam problems.
- The ***substantial quizzes*** will be available on the course Canvas site on weeks 1, 3, 5, 7, and 9, between 2:00 p.m. on Tuesday and 12:00 noon on Wednesday. For each substantial quiz students must log into Canvas and take the quiz in one sitting sometime during this 22-hour window. The quiz will be timed, whereby the students will have to submit their answers within a prespecified number of minutes of starting the quiz (usually 40 minutes).
- Additionally, each chapter of the course will feature a ***self-check quiz***, which is meant to ensure that students are keeping up with the course material. These will be quick and easy. Students must successfully complete them before the due date/time to obtain points.

Problem Sets: Problem sets will be assigned for each chapter but not collected. Students will be expected to complete a variety of the textbook exercises, including all of the ones with solutions in the textbook (Exercises 1, 3, 5 and 9 from each chapter). Solutions will be provided either through videos or in a written form.

Grading Weights: The course will be graded on the curve according to Econ Department standards for Econ 109, which is roughly a 2.9 average GPA for the class and about 25-30 percent A grades. Watson will also track the performance of students who earn participation credit by being on multiple class panels and/or attend office hours. At the end of the quarter, Watson may adjust the grading cutoffs downward to ensure that grades are set appropriately for this sample of students, which can only increase grades for other students in the class. Grading weights: self-check quizzes and participation 28%, substantial quizzes 30%, midterm exams 28%, final exam 14%. Students can drop (or skip) one of the exams.

Pandemic Considerations: Because of the covid-19 pandemic, the number of topics covered in this class will be slightly reduced compared to the amount of material covered in recent years. Also, some adjustments to the grading scale and weights may be made in response to changing conditions and everyone's needs.

Required Textbook: Watson, J., *Strategy: An Introduction to Game Theory* (W.W. Norton), THIRD EDITION.

All students MUST OBTAIN A COPY OF THE BOOK and do so legally. The textbook will be used heavily in the course. Do not steal the book. You can buy or rent a copy from W.W. Norton (e-book is available) or from the UCSD bookstore or another legitimate outlet.

Class Website and Watson's Office Hours: Materials will be posted at https://canvas.ucsd.edu/ on the page for Economics 109. Students should log in regularly to follow the schedule, access video lectures, and check for announcements. Initially, Watson's office hours will be on Wednesdays from 12:00 noon until 2:00 p.m. Pacific time on Zoom. ***Use the same Zoom code as for the discussion sections (see above)***. Watson may eventually change the office-hour schedule.

Teaching Assistants: (Not shown for security)

Procedure for Questions: It is best to ask questions during class meetings, discussion sessions, and in office hours. The TAs will work out a procedure for responding to questions submitted by email or through the course Canvas site. Do not send emails to Professor Watson except to inform him of urgent matters relating to the course (such as letting him know of an illness that necessitates missing an examination).

Additional Policies:

1. Incidents in which students are suspected of cheating on exams will be reported to the administration.
2. Students have one week from the day in which the midterm examinations and quizzes are graded to report errors in grading and/or to request that problems be re-graded. If a student submits his/her exam for re-grading, then the student's entire exam will be re-graded by the professor (with no guarantee of a higher total score).
3. Students should attend and participate in class, but not use their mobile phones and other devices in class except to take notes. The professor will employ the necessary means to discourage classroom distractions. Students whose behavior impedes classroom interaction, attempt to smoke in class, or are disruptive in other ways will be disciplined and may be de-enrolled as university policy allows.
4. Tests (examinations and quizzes) will take place during scheduled class times (lectures and discussion sessions) that appear on the official University course schedule. Students are required to attend lectures and discussion sessions on the days in which tests are held. Students missing a test will be given a zero score for the test. No one will be excused from this rule, except in cases of urgent and serious health issues as well as for exceptions required by university policy. If a student cannot attend an examination or quiz due to an urgent health problem, then the student must report this to the professor as soon as possible. Following the health incident, the student must present documentation to provide evidence that the health incident precluded taking the test (a physician's note is typically sufficient). The student will then be excused from the test and his or her course grade will be determined by appropriately scaling up the grades earned on the other tests. If the missed test is the final examination, then the student will be given an incomplete grade and will have to take the final examination set for the next offering of Econ 109 (in the following quarter) to complete the course.

Understanding the Course Prerequisites:

Students are required to enter Econ 109 with a full understanding of the material covered in Econ 100abc, which include the following game-theory topics presented in Econ 100c:

- Normal-form (matrix) and extensive-form representations [familiarity with]
- Strategies and mixed strategies [operational understanding]
- Best response and dominance [definitions and operational understanding]
- Iterated dominance [definition and operational understanding]
- Nash equilibrium [definition and calculations, also for games requiring calculus]
- Cournot and Bertrand models of oligopoly [ability to calculate the Nash equilibria]
- Mixed-strategy Nash equilibrium [definition and ability to compute for 2x2 games]
- Backward induction and subgame perfection [rudimentary knowledge]
- Stackelberg oligopoly model [ability to calculate the subgame-perfect equilibrium]
- Adverse selection [rudimentary understanding, in particular of lemons markets]
- Moral hazard [rudimentary understanding]

These topics will be presented in Econ 109 at a deeper level than they are covered in Econ 100c. In some cases, Econ 109 will offer a review of what the students learned in Econ 100c, but it will be a rapid review. In other cases, the coverage in Econ 109 will begin where the Econ 100c coverage ended, and so the students must understand these topics at the Econ 100c level before the relevant Econ 109 lectures. Econ 109 also covers more advanced topics and applications that are not covered in Econ 100c.