Economics 109: Game Theory

Summer Session 1, 2020, 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 on line. The meeting schedule follows.

- Class meetings (with lecture content, problem-solving, and examinations) take place on Tuesdays and Tuesdays, 8:00 – 10:50 a.m. Pacific time. ***Attendance is mandatory for all students***. Class meetings will take place on Zoom.
- Discussion sessions on Fridays, 9:00 – 10:50 a.m. Pacific time, also on Zoom.

Parts of the lectures will be recorded and posted on this Canvas site.

Attendance: Students are required to attend the class meetings. Watson will occasionally record attendance and cold-call students during these meetings. There will be no class meetings on university holidays.

Examinations: There will be five 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 also.

- The ***midterm exams*** will take place at or near the beginning of each Thursday class meeting. Students will be required to view the exam questions and submit their answers using this Canvas site, and they must also be present on Zoom so that the instructor and TA can monitor and check identification.
- The ***final examination*** will comprise a take-home part and an interview part. The take-home part will be a set of problems distributed 24 hours before the final examination time in the class schedule (Saturday 1 August, 8:00 - 11:00 a.m.). Students must submit their answers on the Canvas course site before 8:30 a.m. on 1 August 2020. The interview part will take place on Zoom during the scheduled exam time. The instructor and TA will interview each student separately and privately at a preassigned time during the exam period; during the interviews, the instructor or TA will name one of problems on the take-home part, and the students will explain how they solved the problem.
- The **substantial quizzes** will be available on the course Canvas site each week between 1:15 p.m. on Tuesday and 11:45 a.m. on Wednesday. Each week students must log into Canvas and take the substantial quiz in one sitting sometime during this 24-hour window. The quiz will be timed, whereby the students will have to submit their answers within 40 minutes of starting the quiz.
- 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 regularly participate in class and attend office hours and extra sessions. 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 30%, final exam 12%. Students can drop (or skip) one of the exams.

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

All students should obtain a copy of the book and do so legally. The textbook will be used heavily in the course. Students 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 class meetings***. Watson may eventually change the office-hour.

Teaching Assistant: Miles Berg. TA office hours will be shown elsewhere on the Canvas site.

Procedure for Questions: It is best to ask questions during class meetings, discussion sessions, and in office hours. The TA 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.