

## **Economics 109: Game Theory (all sections)**

Fall 2022, 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 mix of traditional lectures and hybrid lectures (flexible use of the class time and a few topics covered by video lectures delivered separately on line). Most class lectures and other meetings will take place in person, in the assigned classrooms. A few lectures and some office hours will take place remotely using Zoom, and these will be announced in advance. The meeting schedule follows.

- **Class meetings (regular lectures):** Tuesdays and Thursdays, 9:30 – 10:50 a.m. (class A00) and 11:00 a.m. – 12:20 p.m. (class B00) Pacific time, in **Peterson 104**. In-class lectures will not be enabled for remote attendance (there will be *no remote option*) but *the second (B00) lecture will be video podcast* for students to watch later (for review or if they cannot attend class). Class meetings that are scheduled to take place remotely will be held on Zoom using the following meeting code:
- **Discussion sections:** Mondays 3:00 – 3:50 p.m. (A01) and Wednesdays 3:00 - 3:50 p.m. (B01) in **RWAC 0121**.

**Attendance, Participation, and Covid19 Protocols:** Students are encouraged to attend the class meetings and to participate in the discussion. There will be no class meetings on university holidays. Students must abide by UCSD's covid19 policies, including properly wearing an approved mask over the mouth and nose during all lectures and other meetings held indoors. Students must not attend class sessions in person if they are feeling ill or are otherwise supposed to quarantine/isolate.

**Examinations and Quizzes:** There will be two midterm examinations, a final examination, and additionally three short on-line substantial quizzes. A non-timed, easy self-check quiz will be posted for each chapter of the course as well, to prompt students to keep up to date with the course material. *Exams and substantial quizzes are required for all students.*

- The *midterm examinations* will be held at 8:00 - 9:20 p.m. on October 18 and November 8 in **PCYNH 106**.
- The *final examination* will be held on Saturday 3 December at 11:30 a.m. - 2:30 p.m.
- The *substantial quizzes* will be available on the course Canvas site on weeks 3, 6, 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. *Retaking a self-check quiz after the due date will lower the credit to 1/2 of the allocated points, so students should not return to self-check quizzes for study purposes.*

**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 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:** The course will be graded on the curve according to Econ Department standards for Econ 109, which is roughly a 3.0 average GPA for the class and about 30 percent A grades. Students who participate often in class, discussion sessions, and office hours will be put on a tracking list. At the end of the quarter, grading cutoffs may be adjusted 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 are: self-check quizzes and participation 20%, substantial quizzes 30%, midterm exams and final exam 50%.

- Each student's total score for the substantial quizzes will be calculated as the sum of this student's top two substantial-quiz scores; the lowest score will be dropped. Thus, students who must skip a substantial quiz (due to health problems or by choice) will not be penalized.
- Likewise, each student's total score for the examinations (two midterms and final) will be calculated as the sum of this student's top two exam scores, with each midterm exam and the final exam having the same weight; the lowest score will be dropped.
- In the middle of week 10, preliminary grades will be determined based on all quizzes and exams except for the final exam, as though everyone obtained zero points on the final exam. Preliminary grades will be set with the normal class grading curve and posted. Students will be guaranteed at least their preliminary grades. With this information, students can decide whether to take the final examination.

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

All students should obtain a copy of the book legally, or borrow a copy, or plan to access a reserve copy at the library. The textbook will be used heavily in the course. Please 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. Here are two sources:

<https://www.vitalsource.com/products/strategy-an-introduction-to-game-theory-third-joel-watson-v9780393904062>

[https://www.amazon.com/Strategy-Introduction-Game-Theory-Third-ebook-dp-B00SLB5KO6/dp/B00SLB5KO6/ref=mt\\_other?\\_encoding=UTF8&me=&qid=1594067437](https://www.amazon.com/Strategy-Introduction-Game-Theory-Third-ebook-dp-B00SLB5KO6/dp/B00SLB5KO6/ref=mt_other?_encoding=UTF8&me=&qid=1594067437)

**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 at either 12:00 - 1:45 p.m. or 8:00 - 9:30 p.m. Pacific time on Zoom, depending on other obligations each week. *Use the same Zoom code as for the discussion sections (see above).* Watson may eventually change the office-hour schedule.

**Teaching Assistants:** 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 TAs will work out a procedure for responding to questions submitted by email or through the course Canvas site.

**Additional Policies:**

1. Incidents in which students are suspected of cheating on exams will be reported to the administration. Instances of academic dishonesty will result in scores of zero applied to the relevant examinations and other assessments, with implications for possible failure in the course.
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 and participate on Zoom. Student may not make audio or video recordings of class meetings in any format. The professor will employ the necessary means to discourage classroom distractions. Students whose behavior impedes classroom interaction, attempt to smoke in class, do not follow covid19 protocols, or are disruptive in other ways will be disciplined and may be de-enrolled as university policy allows.
4. Students are required to attend examinations and quizzes at the times and places that appear on the official University course schedule, except when receiving an accommodation due to special needs or illness. 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. 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. Documentation of the illness is normally required later. 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.

Some students are allowed to enroll in Econ 109 without having taken Econ 100c (particularly engineering and math students). These students must dedicate extra time to learn some of the topics above by watching relevant videos in the Intermediate Microeconomics Video Handbook (IMVH, available in a module here) at the appropriate times throughout the quarter. This is the case particularly for the Bertrand, Cournot, and Stackelberg models, which are covered well in Econ 100c and the IMVH.