Econ 201b: Economic Theory – Spring 2023
Part I

Instructor: Federico Echenique
Office: 509 Evans
Email: fede@econ.berkeley.edu
Office hours: Wednesdays 9 – 11 am
Lectures: Tu-Th 11:00am-12:30pm in Evans 60.
Webpage: eml.berkeley.edu/~fechenique/econ201b/

GSIs
Junru Lyu; email jrlyu823@berkeley.edu
Anna Vakarova; email anna_vakarova@berkeley.edu

Texts: Osborne and Rubinstein, *A Course in Game Theory* (MIT Press, 1994). You may download a PDF from Martin Osborne's webpage at the University of Toronto. I will not follow the book closely, but you are responsible for the material in the book that covers the content in the lectures. Optional: Fudenberg and Tirole, *Game Theory*

About the class. The first half (Part I) of Econ 201b is a graduate introduction to non-cooperative game theory. The class starts from the phenomenon of strategic uncertainty, and guides students through ideas that resolve situations of strategic uncertainty, or offer predictions for such situations. The class describes the two general models of games (normal-form games and extensive-form games), and their corresponding equilibrium notions. The focus is on basic theory and methods, not on any specific applications; but modern economics is very game-theoretic, and specific applications will be covered as examples or exercises in problem sets.

At the end of the class, students are expected to know basic game theory, have an in-depth understanding of its most important results, as well as some of the limitations of the theory. They understand the gap between equilibrium and common knowledge of rationality. The can evaluate when a solution concept is too lax, and refinements are warranted. They also learn how Bayesian modeling can capture situations with asymmetric information. Students should know how to "think game theoretically," and learn how to

approach new situations that can be modeled as games. They understand how intertemporal tradeoffs affect incentives in repeated situations. Students are trained in solving games by computing equilibria. They also learn some of the ideas and methods from mathematical analysis that economic theorists commonly use in analyzing economic models.

Electronics in class.

Please refrain from using your phone, or any other electronic device, during class. You may use a computer, or a tablet, to take notes; but do not use your device for anything else. If you need to communicate with anyone during class, please step out of the classroom.

Prerequisites.

Econ 201b is a mathematical introduction to game theory. There are definitions, theorems and proofs. Familiarity with the material covered in Econ 204 and Econ 201a is crucial: Econ 204 and 201a are prerequisites for Econ 201b.

Before the class starts, you are encouraged to refresh your understanding of the separating hyperplane theorem, and of the fixed point theorems covered in Econ 204. You may also want to ensure that you know the "maximum theorem" (regarding the continuity of the solution of optimization problems in the problem parameters), as described in, for example, Chapter 3 of Mas-Colell Whinston and Green where it is used to show that demand is continuous.

Please read the handout on basic definitions and notation, as the lectures will assume familiarity with the conventions described in the handout.

Grading Your grade on Econ 201b is the average of the grade that you obtain in each half of the class, specifically of the normalized grade (the z-score) in each half. The grading policy for the first half is as follows: Problem sets count for 25% of a student's grade.[1] A midterm exam, to be completed in class on March 2nd, counts for the remaining 75%. The exam is closed book. To obtain a passing grade in the first half of 201b, you must have returned solutions to all problem sets, and obtained a passing grade in the midterm.

[1] A problem set worth x points that is returned t days late is worth $x(1/2)^t$ points.

Problem sets are handed out, and turned in, weekly on Tuesdays after lecture. You are expected to attend GSI sections, where problem sets will be discussed. For the problem sets, you are encouraged to work in groups of up to four students. Each individual student should first attempt all the problems on their own. They should then meet as a group to discuss their solutions, and arrive at a consensus answer, which is written up and handed in by the group. Please form groups at the beginning of the semester, and keep the same groups throughout the first half. You may type up the answers to a problem set using LaTeX, or turn in hand-written answers as long as they are easy to read.

Syllabus

1. Introduction. Individual decision-making. Bayesianism and rationality. Domination and the "domination theorem" (a complete class theorem).

2. Strategic uncertainty. An introduction to strategic uncertainty: backward induction in perfect-information games.

3. Normal-form games - I. Definition of normal-form games. Examples. Rationalizability and iterated elimination of dominated strategies. Nash equilibrium. Bayes Nash equilibrium in games of incomplete information. Applications: Voting in juries; the market for lemons.

4. Normal-form games - II. Correlated equilibrium. Zero-sum games and the minimax theorem. Quantal response equilibria. Equilibrium multiplicity.

5. Knowledge and common knowledge The partitional model of knowledge. Common knowledge. Agreeing to disagree and the impossibility of speculative trade.

6. Extensive-form games - I. A model of extensive-form games. Subgame-perfect Nash equilibrium.

7. Extensive-form games - II. Repeated games: finitely and infinitely repeated games. The one-stage deviation principle. The Nash reversion folk theorem. The folk theorem.

8. Extensive-form games of incomplete information Perfect Bayesian equilibria in multi-stage games of incomplete information.