ECON 3305: Game Theory and Strategic Behavior

Time & Location: T,Th 11:40-1:05, Hubbard 213 (Pickering room)
Professor: Dan Stone, dstone@bowdoin.edu, @d_f_stone
Office hrs (Drop-in hrs): Hubbard 108; M and W, 2:15-3:45. If you’d like to meet and can’t make it at those times, please email me to set up an appointment.

Prerequisite: Intermediate micro (Econ 2555). I will teach/review appropriate math methods as they come up (e.g. probability theory, set theory, methods of proof).

Course description and learning goals: This course will cover the main topics of non-cooperative game theory in a mathematically rigorous way. Game theory is the mathematical study of behavior in strategic settings: situations in which an individual must think about other individuals’ perspectives and choices to determine one’s own optimal choice(s). Game theory began as a sub-field of applied mathematics and is now immensely influential and widely used across the social and natural sciences.

We’ll emphasize mathematical rigor for three reasons: 1) to discuss game theoretic ideas with more precision and clarity; 2) to improve the precision and clarity of your thinking in general; and 3) to help prepare students for potential future research and/or graduate study in economics, which involves plenty of math. We will be following the textbook closely, as it uses the appropriate level of math for our purposes, and still includes many applications, but there will also be a number of readings from other contexts, including academic journal articles.

In addition to learning the substance of game theory and improving your mathematical skills and logical thinking, I’m hoping this class will help to both enhance your understanding of strategic interactions—and to improve your own performance (i.e., your strategic thinking and choices, and your understanding of the perspectives and choices of others)—in everyday life.

Books/resources: Watson, J., Strategy: An Introduction to Game Theory, 3/e. I like this book because it is concise, clear, complete, uses the right level of math, and provides a good number of well-written problems. You’re very welcome to use another (cheaper!) edition; the material will be only slightly different.


**Web/email:** All essential course documents (including slides, homework and test solutions) and grades will be posted to blackboard or emailed to you. In general, I’ll make announcements/reminders in class, but will also sometimes email you announcements and clarifications of material from class.

**Teaching philosophy/methods for this course:** I’ll use a combination of interactive lecture, classroom versions of game theory games, in class group and individual problem solving, and teaching technologies (Blackboard, clickers). I encourage you to interrupt me during lecture with questions and comments often—this will usually help to clarify something that others were wondering about as well, keep you more engaged, improve your public speaking skills (yes, not really public speaking, I know, but close), help me learn from you, and will help prevent me from doing too much of the talking. If your question is on a topic most appropriately addressed outside of class, I’ll let you know.

I use somewhat incomplete powerpoint slides to guide the lectures (these are my lecture notes), and post the slides to blackboard. But, to be clear, the slides only make complete sense in conjunction with class notes/experience. I recommend that you take notes in class as if the slides won’t be posted, and then just refer to them as necessary. If you have questions later, first try asking classmates, then ask me. Some of the material we’ll discuss in class is background you won’t be tested on; some of the material you need to know will be straightforward and basically common sense; and some is abstract and fairly deep. I will try to go over the background and straightforward parts quickly, assuming you can easily clarify with the book if necessary, and spend more time on the tougher and more interesting material, including going beyond the textbook where I feel it is useful and/or appropriate.

Since learning this material requires hands-on work—problem solving—some class time will be devoted to working through problems, and I will also ask you to work on problems on your own as homework. This will prepare you for tests, where you will also be asked to solve problems on your own, as this is the best way to demonstrate knowledge of the material. And since game theory is indeed the study of games, we’ll explore playing games ourselves in the classroom. This is useful pedagogically (for learning!)—and fun.

**Assignments:** There will be three somewhat lengthy homeworks, two journal article assignments, two midterms, and a final. The homeworks can be completed with a partner. All non-test assignments are due at start of class and there is a 10% penalty per day turned in late (0-24 hrs late = 10% off; 24-48 hrs later = 20% off, etc). Please do your best to submit on time and if you can’t submit on time, submit early.

There are two journal article assignments: 1) a 5 minute presentation; 2) a 1-2 page written report. In both assignments you will summarize and briefly analyze a randomly assigned article (from the list of articles below). This is to help you gain a more in-depth understanding of these ideas and related scholarship. Details on these assignments to come. Journal articles we’ll likely use are:

• SPNE, Bargaining: Neelin et al, AER, 1988; Ochs and Roth, AER, 1989; Hoffman et al, GEB, 1994; Cameron, EI, 1999; Heinrich, AER, 2000; Levitt et al, AER 2011; Spenkuch et al, AER, 2018
• Auctions: Lucking-Reiley, AER, 1999; List and Lucking-Reiley, AER, 2000; Kagel and Levin, Ecta, 2000; Bajari and Hortascu, Rand, 2003; Carpenter et al, EJ, 2008; Azevedoy et al, WP, 2018
• Signaling: Prendergast and Stole, JPE, 1996; Morris, JPE, 2001; Gentzkow and Shapiro, JPE, 2006; Han et al, JM, 2010; McDevitt, JPE, 2014; Stone, SEJ, 2016

The final will emphasize the material covered after midterm 2, but will also cover key topics from earlier in the semester. The tentative dates for all assignments and readings are on the course schedule below. Make-up finals/midterms will only be given when you are not able to attend for a verifiable reason, with documentation. You should email me as soon as possible if you require a make-up test.

Grading: Your final course numerical grade will be an average of the homework/journal assignment grade, and each of the three tests (25% weight on each of these). The homework/journal grade will put equal weight (1/5) on each of the five components (3 homeworks and 2 journal articles). I use a 10 pt grading scale for the course letter grade with 3 pt ranges for +/- (>=93 is A; >=90 and < 93 is A-; etc) with the possibility of curving up, which tends to happen more often for the lower scores. Following a policy used in other classes in the department, final grades on the margin between two letter grades (e.g. B+/A-) may be adjusted based on class participation.

Advice on how to succeed in this course, and feedback: First and foremost, focus in class, and work hard on the homeworks. Read the chapters before and/or after lecture. If some topic doesn’t make sense after lecture and looking at the book, talk to others (classmates and/or me) to clarify. If you miss a class, try to get notes from a classmate, and compare to slides from blackboard and make sure everything makes sense—if not talk to classmate(s) and/or me.

Start the homeworks early, work on them until you get stuck. Then refer to your notes, the book, etc, to see if you can make more progress. If you’re still stuck, step away from it for a day. Fresh eyes can make a big difference. Think about the problem some more, and if you’re still stuck after that, consult others for help. I will discuss this further as the exams approach. If you get homework/test problems wrong, and even if you get them right, check the solutions and be sure you understand them. If not, talk to others and/or me.

Given that the solutions are posted, I generally will not write detailed solutions/comments on your graded assignments. You’ll get a lot of feedback just by doing problems and seeing how well you can solve them, and what you need help with. But I’d be happy to discuss additional feedback with you anytime, and if I think I need to communicate something specific to you I will reach out to let you know.

Course schedule and readings (subject to change; readings from Watson unless otherwise noted):
Parts I-II: Representations and assumptions, Behavior in static settings

5-Sep  Syllabus, intro to the field and history (Harford, ch 2; Rodrik chs), Chs 1-2, Extensive form
10-Sep  Set theory; Ch 3, Strategy, normal form (Appendix A section on Sets)
12-Sep  Ch 4-5, Beliefs, mixed strategies, other assumptions (Elephant In The Brain on common knowledge; optional: Geanakoplos, JEP, 1992)
17-Sep  Ch 6; Dominance, best response
19-Sep  No class (out of town for conference)
24-Sep  Ch 7-8, Rationalizability, iterated dominance (ch 8 up to “Social Unrest”)
26-Sep  Ch. 9, Nash equilibrium (skip “Congruous Sets”); rationalizability papers
1-Oct   Ch 10, Nash applications; classic games/risk dominance HW1 due
3-Oct   Ch 11, Mixed strategy NE
8-Oct   Review/catchup; NE/mixed strategy papers
10-Oct  Midterm 1
15-Oct  Fall break

Part III: Behavior in dynamic settings
17-Oct  Ch 14-15, Backward induction (skip “Forward induction…”)
22-Oct  Ch 16 (possibly skip “Dynamic Monopoly”), IO applications
24-Oct  Ch 18, Bargaining
29-Oct  Ch 19, Bargaining ctd (possibly skip “Multilateral Bargaining”)
31-Oct  Ch 22, Repeated games (up to “The equilibrium payoff set”); backward induction/bargaining papers
5-Nov   Ch 23, Collusion; HW 2 due
7-Nov   Review/catchup; repeated games/collusion papers
Nov 8:  Joe Harrington seminar
12-Nov  Midterm 2

Part IV: Information
14-Nov  Ch 24-5, Incomplete info; risk in contracting; principal-agent models
19-Nov  Principal-agent models ctd; start auctions (Easley and Kleinberg chapter)
21-Nov  Ch 26-27 (auctions section only for 27), Bayesian Nash (Radical Markets selection?)
26-Nov  Auctions papers, start signaling games
28-Nov  Thanksgiving
3-Dec   Ch 28-29, Perfect Bayesian equilibrium, signaling games
5-Dec   PBE continued; signaling papers
10-Dec  Other PBE applications as time allows (disclosure, observational learning, counter-signaling, poker/Brokos book?); HW 3 due

Final exam: Wed, Dec 18, 1:30-4:30