

Econ 602: Game Theory Fall 2008

Course Description: This course is the second part of the graduate microeconomics sequence. This course is an introduction to game theory. No previous knowledge of game theory is assumed, but students who have not studied game theory before should take the course only if they feel comfortable with mathematical modeling. The course will move relatively fast through the more elementary material.

Instructor: Tilman Börgers. My office is 337 Lorch. My e-mail address is: tborgers@umich.edu. My office hours are Mondays and Wednesdays, 4.30-5.30pm.

Textbooks: The textbook for this course is:

- Andreu Mas-Colell, Michael Whinston and Jerry Green, *Microeconomic Theory*, New York and Oxford: Oxford University Press, 1995.

This is a graduate textbook that deals with all of microeconomic theory. We shall only cover part 2 of the book. Other introductions to game theory that you might consult and that cover very similar material are:

- Robert Gibbons, *Game Theory for Applied Economists*, Princeton: Princeton University Press, 1995.
- Martin Osborne and Ariel Rubinstein, *A Course in Game Theory*, Cambridge and London: The MIT Press, 1994.

Gibbons' book is at the advanced undergraduate level. If you have had no previous course in game theory you will find this book most accessible. Osborne and Rubinstein's book is a graduate level course in game theory that covers a little more than we will be able to cover in this course. If you have had a previous game theory course, and would like to know more, then you might find this book particularly interesting.

Lectures: We meet on Mondays and Wednesdays, 2:30-4 pm, in 269 Dennison Hall. The first lecture is on Wednesday, 22 October. The last lecture will be on Monday, 8 December. I will use slides in PDF format in the lectures. The slides used in the lecture will be made available on C-Tools.

Problemsets: Problems can be downloaded from C-Tools. Homework does not enter your course grade. However, you can give answers to starred questions to your GSI and he will grade your answers.

Discussion Sections: There are two discussion sections, Thursdays, 4-5.30 pm, in 269 Dennison Hall, and Thursdays, 6-7:30 pm, in 373 Lorch Hall. Discussion sections start on Thursday, 23 October. The earlier discussion section will cover the problem sets given out in class. The later discussion section will cover elementary material that the lecture leaves out. The later discussion section is meant for students with no previous course in game theory.

GSI: Dmitry Lubensky. His e-mail address is: dluben@umich.edu. His office hour is Tuesdays, 4.30-6pm, in room 271, Dennison.

Grading Policy: There will be one quiz in class, and one final exam. The dates are:

- Monday, November 17, 35 minute quiz. (30%)
- Wednesday, December 17, 10:30 - 12:30, final exam. (70%)

Please note the above dates, and keep them free from any other obligations. I can offer alternative dates for the quiz or the final only in exceptional circumstances. If there any such exceptional circumstances that can be anticipated, you need to inform me about these no later than Friday, October 31.

Expectations for the Quiz and the Final Exam: The quiz and the final exam will consist of formal problems. Please provide answers that are written sufficiently carefully so that I can read them. Please give rigorous and complete answers. Explain all required steps of your argument. Do not leave out calculations. Do not leave out steps of an argument even if the mathematics are trivial, but if the step is of conceptual relevance to the argument.

Disabilities: If you believe you need an accommodation for a disability, please let me know at your earliest convenience. Some aspects of this course may be modified to facilitate your participation and progress. As soon as you make me aware of your needs, we can work with the Office of Services for Students with Disabilities to help us determine appropriate accommodations. I will treat any information you provide as private and confidential. Please get in touch with me about this not later than Friday, October 31.

Syllabus

References are provided to the three textbooks listed on page 1. The acronym MWG stands for “Mas-Colell, Whinston and Green”.

Topic 1: Static games with complete information: dominance and rationalizability.

MWG: Chapter 8.A, 8.B and 8.C; Gibbons: Chapter 1.1.B; Osborne and Rubinstein: Chapter 4.

Topic 2: Static games with complete information: Nash equilibrium in pure strategies.

MWG: Chapter 8.D (up to the top of page 250); Gibbons, Chapter 1.1.C and 1.2; Osborne and Rubinstein: Chapter 2.

Topic 3: Static games with complete information: Nash equilibrium in mixed strategies.

MWG: Chapter 8.D (pages 250-253; if you feel confident please read also Appendix A); Gibbons: Chapter 1.3; Osborne and Rubinstein: Chapter 3.

Topic 4: Static games with incomplete information: Bayesian Nash equilibrium.

MWG: Chapter 8.E; Gibbons: Chapter 3; Osborne and Rubinstein: Chapter 2.6.

Topic 5: The extensive form and the normal form representation of games; pure strategies, mixed strategies, and behavioral strategies.

MWG: Chapter 7; Gibbons: Chapter 2.4.A; Osborne and Rubinstein: Chapter 11.

Topic 6: Dynamic games with complete information: subgame perfect equilibrium.

MWG: Chapter 9.A and B, Chapter 12.D and Appendix A to Chapter 12; Gibbons: Chapter 2.1.-2.3 and Chapter 2.4.B; Osborne and Rubinstein: Chapters 6.1-6.5, 8.1-8.5 and 8.8

Topic 7: Dynamic games with complete information: sequential equilibrium.

MWG: Chapter 9.C; Gibbons: Chapter 4.1; Osborne and Rubinstein: Chapter 12.1-3 (up to page 237).

Topic 8: Dynamic games with incomplete information.

MWG: Chapter 13.C; Gibbons: Chapters 4.2.A, 4.2.B and 4.3.C.; Osborne and Rubinstein, Chapters 12.3.1 and 12.3.2.

More Books about Game Theory

Textbooks:

Some further alternatives to the textbook for this course are:

- Ken Binmore, *Playing for Real, A Text on Game Theory*, Oxford: Oxford University Press, 2007.
- Martin Osborne, *An Introduction to Game Theory*, Oxford: Oxford University Press, 2003.
- Drew Fudenberg and Jean Tirole, *Game Theory*, Cambridge and London: The MIT Press, 1993.
- Roger Myerson, *Game Theory, Analysis of Conflict*, London and Cambridge: Harvard University Press, 1991.

Among these, the first two are undergraduate introductions to game theory. Osborne's book is similar in structure and style to Osborne and Rubinstein's graduate book that is one of the recommended textbooks for this course. You might find it helpful if you are attracted to Osborne and Rubinstein's style, but find their graduate book a little difficult. Binmore's book is entirely different in style from the other books. It is very entertaining and clever, but idiosyncratic and opinionated.

Fudenberg and Tirole's book is a comprehensive overview of game theory at a more advanced level than the books used in this course. Myerson's book is rather demanding, too, and it offers a more idiosyncratic perspective.

Classics:

- Harold W. Kuhn, *Classics in Game Theory*, Princeton: Princeton University Press, 1997.

This is a collection of important articles on game theory that were published between 1950 (John Nash's paper "Equilibrium Points in n -Person Games") and 1975 (Reinhard Selten's paper on trembling-hand perfect equilibria).

- Duncan Luce and Howard Raiffa, *Games and Decisions*, New York: Wiley, 1957 (reprinted by Dover Publications in 1989).

This is one of the first textbooks on game theory.

- Thomas Schelling, *The Strategy of Conflict*, London and Cambridge: Harvard University Press, 1960; and *Micromotives and Macrobehavior*, New York and London: W. W. Norton & Company, 1978.

Thomas Schelling's writings are informal and accessible, and contain many important ideas that have later been gradually incorporated into formal game theory.

Evolution and learning in games:

- Drew Fudenberg and David Levine, *The Theory of Learning in Games*, London and Cambridge: The MIT Press, 1998.
- Jörgen Weibull, *Evolutionary Game Theory*, Cambridge and London: The MIT Press, 1995.

These two books cover important and interesting aspects of game theory that we will not have time to address at all.

Bounded rationality in games:

- Colin Camerer, *Behavioral Game Theory: Experiments in Strategic Interaction*, Princeton: Princeton University Press, 2003.
- Ariel Rubinstein, *Modeling Bounded Rationality*, Cambridge and London: The MIT Press, 1998.

These two books describe two very different approaches to behavior in games where this behavior deviates from classic rationality postulates.