Economics 209A
Theory and Application of Non-Cooperative Games
(Fall 2013)

Course Outline

I. Contact information

Location and time: 648 Evans Hall Mon 10-12 (except Nov 11th)

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II. General information

The course presents some of the main topics in Game Theory and designed to develop theoretical tools. Owing to the limitation of time, the topics covered will necessarily be only a small fraction of what one could (and ideally, should) cover in this course, and thus, the course cannot provide a complete coverage of game theory.

The course is intended to give PhD students an advanced course in Game Theory and can be used as one of the two courses for Economics PhD students towards the Advanced Theory Field Examination. As such, the course is oriented to students wishing to go into research in theory by emphasizing the foundation of the theory and giving precise definitions and full proofs of results. The general style of the course is formal, and the number of theorems and proofs is relatively high. For some parts, the formal mathematical requirements are not mild.

However, because game-theoretic techniques are used in all fields of economics, the course is also recommended for students who want to do applied research and not specialize in pure (harsh) theory. We will not be spending much time developing applications (in that sense, the course catalogue description is somewhat misleading). Still, the first-year core courses for the PhD do not go deep enough into details for students who anticipate applying the theory in their research.

III. Prerequisites

The course is open solely to PhD students and specially qualified undergraduates. The prerequisite is a solid foundation in microeconomics – the first-year microeconomics courses in the Economics PhD, 201A and 201B. Thus, to enroll in the course one must be familiar with the basic concepts of game theory at the core course level. Even so, there is probably variance in the extent of exposure to the materials in the course, and there may be gaps that one should catch up on, in particular if she or he did not take the first-year Economics PhD courses in the department. Please come to see me as soon as possible if you do not feel confident that you have the necessary background.

IV. Office hours

Mondays 2-4 PM by appointment only. You can e-mail any question, and I will try to respond promptly. There is no GSI for the course so please use me as such. In case you have any trouble, there are plenty opportunities for help. I would also be happy to discuss with you any issues beyond the course work, not necessarily of game-theoretic substance.

Please sign for only one time slot unless absolutely necessary. If you cannot make it to the time slot you are scheduled for, please e-mail me or call (510-250-2529) to cancel your appointment. This will allow me to offer that slot to another student. There is no no-show/late-cancellation fee but please be considerate.

V. Reading material

Handouts The class will rely on handouts that will be given for each class and also be available for downloading in PDF format form the course website. The notes will contain a very large amount of the material in the course, but are only necessary (and not sufficient) readings. They are work in progress and inevitably contain errors. I would appreciate being told of any errors found in the notes.

Books The only required textbooks for the course are

- Osborne M. and A. Rubinstein, *A Course in Game Theory*, MIT Press, 1994 (hereafter, OR).

- Fudenberg D. and J. Tirole, *Game Theory*, MIT Press, 1994 (hereafter, FT).

These books present the main topics of game theory at a level suitable for our purposes and emphasizes the theory's foundations as well as recent topics in game-theoretic research. The books provides precise definitions and full proofs of broad range of results. The notation and mathematical definition in the book are standard. OR and solution manual can be downloaded (for free) from the authors' websites. There are also many more excellent books around. Three other game theory textbooks are:

- Osborne M., *Introduction to Game Theory*, Oxford University Press, 2003.

- Krishna V., *Auction Theory*, Elsevier, 2009 (hereafter, K).

- Gibbons R., *Game Theory for Applied Economists*, Princeton University Press, 1992.

- Myerson R., *Game Theory: Analysis of Conflict*, Harvard University Press, 1997.

Osborne presents the main topics of game theory at an accessible level, and contains excellent review questions. Gibbons is less advanced. I do not particularly suggest any of them for this course unless you are really struggling with the material or otherwise announced in class. Good additional references for the course are the standard graduate level Microeconomic Theory textbooks:

- Kreps D., *A Course in Microeconomic Theory*, Princeton University Press, 1990 (Chapters 11-15).

- Mas-Colell A., J. Green and M. Whinston, *Microeconomic Theory*, Oxford University Press, 1995 (part III).

Kreps is relatively chattier. For experimental game theory, which is one candidate for being covered as an optional topic:

- Camerer C., *Behavioral Game Theory: Experiments in Strategic Interaction*, Princeton University Press, 2003.

The book describes hundreds of different experimental studies that show where game theory predicts well and where it predicts poorly, and suggests some new kinds of theory.

Articles Many references to related journal articles are scattered throughout the class notes and I will mention them as we go along and thus not repeat them here. I also try at the end of each class note to indicate where you should go for more coverage of the topics under discussion. Also, you should check the end of each chapter in OR and FT and refer to references section for details. Those who are interested in pursuing research in theory should read these articles.

VI. Problem sets

The course will rely heavily on problem sets. The problem sets are meant to be learning tools and thus will be not counted for the course grade. All questions in the covered chapters from OR and FT are a required material. Please work on the problem sets with each other (and with me). Some answer keys will be distributed and available for downloading from the course web page.

VII. Exams

The requirements for a grade in the class are as follows. There will be a mid-term exam and a final exam (each worth approximately 1/2 of the class grade). The exams will test your basic knowledge in the course material and the ability to apply this material to new problems. Exams will be closed book and based on problem set type questions. The midterm examinations will be held on Mon Oct 14th during class time. The final examination will take place during all university examination week. Further details will be given later in the semester.