ECON 7110 Syllabus (First Half)

2025 Spring

Instructor

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Course Meeting: Tuesday and Thursday, 1:45-3:15pm, PCPE 101
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Course Topic and Prerequisite

This is a graduate introduction to game theory designed for first year Economics Ph.D. students. Students from other background are welcome, but they should have seen some undergraduate level game theory and be comfortable with rigorous mathematical analysis.

The goal of this course is to provide a systematic and formal framework to study *strategic interactions*, where an individual's decision will affect the well-being of other individuals and that the decisions of those individuals will in turn affect one's own well-being.

As confusing as the term may be, the "games" we will study are much broader than the games in the traditional sense, such as board games or competitive sport games. In particular, these are what we call "zero-sum" games, where the players have completely opposite interests. In economic applications, there is typically a mixture of conflict and cooperation motives.

Our models often abstract away from certain details and try to distill the major or interesting strategic forces underlying the interaction. This comes at a cost of over simplification or being "unrealistic." However, we are hopeful that these stylized models could offer useful insights for practical strategic decision making.

Course Outline

1. Representing Games
   (a) Extensive Form
   (b) Normal (Strategic) Form
2. Simultaneous-Move Games
   (a) Dominance and Rationalizability
   (b) Nash Equilibrium
   (c) Normal-Form Refinement
   (d) Incomplete Information, Bayesian Games, and BNE
3. Dynamic Games
   (a) Subgame Perfection and Backward Induction
   (b) Sequential Rationality and Weak PBE
   (c) Sequential Equilibrium

Textbooks

A substantial part of the course material will follow George's "*Modeling Strategic Behavior*." You can obtain an electronic version from George's webpage.

Other reference materials:

- "*Game Theory,*" by Fudenberg and Tirole
- "*Game Theory for Applied Economists,*" by Gibbons
- "*Lecture Notes for 1st Year Ph.D. Game Theory,*" by Kartik
- "*Microeconomic Foundations II,*" by Kreps
- "*Microeconomic Theory,*" by Mas-Colell, Whinston, and Green
- "*A Course in Game Theory,*" by Osborne and Rubinstein

Mathematical Background

The *only* necessary mathematical background is being comfortable with abstract concepts and mathematical logic. The major challenge in learning game theory is not math per se, but rather the ability to play around with different concepts and understand their connections.

With that being said, being familiar with math will be helpful in this class. One reason is that mathematics often exposes you to abstract definition and rigorous logics.[1] Another reason is that we will indeed use a few mathematical results without proving them. This includes the properties of sequences and their limits, the separating hyperplane theorem, and Kakutani's fixed point theorem.

Grades

Grades are determined by performance on homework assignments and a midterm exam. The weight of the homework is 10% and the weight of the midterm is 90%.

Assignments: There will be weekly homework assignments during the first half of the course. Assignments and other course documents will be posted on Canvas. The due date will be noted on the assignments. Homework assignments are designed to give you a hands-on perspective on the material as well as practice for the exam. It is therefore best to attempt the assignments on your own first but collaborating with others when you are stuck is encouraged.

Exam: The midterm will take place on March 6th, the last day of the first half of the term.

Grading: Careful explanations should be written out for your answers, unless a question explicitly states that an explanation is not required. You should show your work to an extent that convinces the grader you solved the question and not merely copied the solution. All problem sets will count toward the final grade.

[1] A good resource created by Terence Tao where you can play with first-order logic.