

Intro to Decision Theory and Game Theory

This half course continues the Micro Theory course sequence, starting October 24, 2002. See also my personal web page teaching link www.umich.edu/~lones/teach.html.

TEXTS. The text is Mas-Colell, Whinston, and Green's *Microeconomic Theory*, denoted *MWG*. It is far from an ideal text, but it is the only one with most of the required coverage. To make up for its deficiencies here, I have placed other books on Foster reserve: Gibbons' *Game Theory for Applied Economists* [*G*] is excellent. Those destined for advanced theory can look at Fudenberg and Tirole's [*FT*] *Game Theory*. Some students may enjoy Schelling's 1960 classic *Strategy of Conflict*, which anticipated some of game theory's best findings since 1970. Also on reserve: Dutta's [*D*] *Strategies and Games*; Osborne and Rubinstein's [*OR*] *Course in Game Theory*; Krep's *Course in Microeconomic Theory*.

GRADES. Three quizzes graded by the GSIs comprise at most 30% of your grade. The dates are during the Thursday class **November 7**, and sections on **November 21**, and **December 5** (1372 EH). The final exam on **Tuesday, Dec 18** from **1:30– 3:30PM**. To ensure sequential rationality in your quiz-taking behaviour, your final numerical grade for 602 will be

$$(0.7)(\text{final exam}) + \sum_{i=1}^3 (0.1) \max(\text{quiz } i, \text{final exam})$$

PRE-TEST JAM SESSIONS. I will hold special problem-solving sections on the Wednesday nights before quizzes #2, #3 and Tuesday before the final at *7PM in Lorch 201* — that is, on **November 6**, **November 20**, and **December 4**. [I am out of town around the final.]

GETTING HELP. Talk to Kata or Andreas. Or, if you email me questions, I try to respond promptly. My response time is least before midnight. My office hours are **Thursday and Friday 2:30-3:30PM**.

PROBLEM SOLVING. I will hand out many problems, and suggest many questions from *MWG*. They will not be graded, but the GSIs will supply solutions. Here's how you get the most out of the homework: First try to solve each problem *solo*; if that fails after some passage of time, ask your friends; then ask for a hint from the GSI; then read the solutions; then go back to the GSI, or ask me. A doctor of philosophy ideally requires insight more than algorithm. Please expend the mental energy to learn the process of discovery. If you find the solution yourself, you will learn to think; even if you miss finding the solution yourself after hours of trial, you learn what lines of thinking lead to dead-ends.

Polya's *How to Solve It* is on reserve. Everyone should master the basic principles of problem solving: It not only determines who passes the prelims, but who excels in research.

Course Outline

I. Static Choice Under Uncertainty (3 lectures)

- ↔ von Neumann Morgenstern expected utility theorem [*MWG* §6.B]
- ↔ Independence axiom, Allais Paradox, and Prospect Theory [Kahneman-Tversky]
- ↔ State-dependent utility [*MWG* §6.E]
- ↔ Subjective expected utility, Ellsberg Paradox [*MWG* §6.F, Kreps §3.4]
- ↔ Risk aversion [*MWG* §6.C]
- ↔ Stochastic dominance theorems [*MWG* §6.D]

II. Game Theory (9 lectures)

Quiz #1

A. Strategic Form Games of Complete Information (2.5 lectures)

- ↔ Dominance solvability and rationalizability [*MWG* §7D–E, 8.A–C]
- ↔ Pure and mixed strategy Nash equilibria [*MWG* §8.D]
- ↔ Zero-sum games, Minimax Theorem [von Neumann, *D* §10]

B. Extensive Form Games of Complete Information (2.5 lectures)

- ↔ Backward induction; subgame perfection [Selten, *MWG* §9.B]
- ↔ Application: Time consistent choice over time and multiple selves (Strotz)
 - Link to normal form trembling hand perfection [Selten, *FT* §8.4.1]
- ↔ Exogenously Repeated Games and the Folk Theorem [*G* §2.3.D; *D* §15]
- ↔ Endogenously Repeated Games
 - Bargaining as Temporal Monopoly: Rubinstein's discrete-time game [*G* §2.1.D]
 - Timing games: wars of attrition and pre-emption games [*FT* §4.5]
 - Bilateral Monopoly: Aspirational Bargaining [Smith-Stacchetti]
 - Caller #5: Timing Games that Morph from One Form to Another [Park-Smith]

C. Strategic Form Games of Incomplete Information (1 lecture)

Quiz #2

- ↔ Bayesian decision theory
- ↔ Bayes-Nash equilibrium [Harsanyi, *MWG* §8.E]
- ↔ Application: Auctions

D. General Extensive Form Games (3 lectures)

- ↔ Extensive forms; behaviour strategies; Kuhn's Theorem [*MWG* §7.C,E]
- ↔ Sequential equilibrium [Kreps and Wilson, *MWG* §9.C]
 - Forward induction, and burning money [*OR* 6.6]
- ↔ 'Intuitive' refinement [Cho-Kreps, *MWG* §9.D, *G* §4.4]
 - Application: Reputation [*G* §4.3.B,D, *OR* §12.3]

Quiz #3

¶ Note: Topics denoted ○ are time permitting.