ECON 4108: Advanced Game Theory and Applications

Fall 2020 | University of Minnesota | Instructor: Prof. Anmol Bhandari | Teaching Assistant: Bipul Verma

Course Overview

Rigorous training in game theory and applications. Develops static and dynamic games in mathematically rigorous framework with emphasis on formal proofs. Analyzes strategic behavior in multi-agent settings and applies to oligopolistic competition, auctions, and political economy.

Required Textbook

Osborne, M. J. (2004). *An Introduction to Game Theory*. Oxford University Press.

Topics Covered

- Foundations: Strategic form games, Nash equilibrium (existence, computation, refinements), mixed strategies, rationalizability
- Dynamic Games: Extensive form games, subgame perfect equilibrium, backward induction, repeated games, bargaining theory
- Incomplete Information: Bayesian games, signaling games, perfect Bayesian equilibrium, screening models
- Applications: Oligopolistic competition (Cournot, Bertrand), auction theory, political economy, mechanism design, industrial organization

Prerequisites

ECON 3101, ECON 3102, MATH 1271, MATH 1272, and two 4xxx-level Economics courses. Strong background in multivariate calculus, convex optimization, and probability theory required. Emphasis on formal mathematical reasoning.

Assessment

In-class quizzes (20%), midterm exam (30%), final exam (40%), homework assignments (10%). Group homework allowed (up to 4 students). Exams emphasized rigorous mathematical reasoning and application to novel problems.

Teaching Responsibilities

Led weekly recitation section focused on problem-solving and proof techniques. Presented detailed homework solutions, clarified complex theoretical material, assisted with mathematical proofs, held office hours, graded assignments and exams.

Learning Outcomes

- Analyze strategic interactions using formal game-theoretic models
- Compute and characterize Nash equilibria and refinements
- Apply game theory to oligopoly, auctions, and political economy
- Construct and evaluate formal proofs