

Advanced Microeconomics: Game Theory and Applications

Teachers: Olivier Gossner, Frederic Koessler

Duration: 24 hours

Number of ECTS credits: 4

Education Level	Period	Language of instruction	Max. class size	Teaching Mode
Master	S1	English	25	In-Person

Prerequisites: Basic notions in microeconomic theory, information economics and game theory

OVERVIEW

The course explores strategic aspects of information in games. Topics include, among others: the value of information, modeling knowledge and inattention, optimal bluffing, betting, reputation, global games, speculative attacks, bank runs, repeated games, information design, strategic communication, and mediation. Applications will be discussed in areas such as conflict analysis, policy and investment advice.

LEARNING OUTCOMES

By the end of the course, the student will understand the foundations of information in game theory. They will be able to analyze, solve, and construct theoretical models of games with incomplete information. They will also be able to apply these models to economic, business, and financial settings where information is crucial.

Whether pursuing an academic or business career, the student will be equipped to use existing models—or develop new ones—to better understand the strategic role of information in abstract game-theoretic and mechanism design problems, as well as in practical applications such as industrial organization, business strategy, and finance.

DETAILED DESCRIPTION

Information is a central concept in game theory. It matters both when exploring the foundations of equilibrium concepts and when agents face uncertainty about the strategic situation or must rely on knowledge—either their own or acquired from others. This course examines both fundamental and advanced topics related to information, equilibrium, and robustness in games.

The first part of the course focuses on modeling information and knowledge in games and introduces key solution concepts for normal-form games, including minmax strategies, correlated equilibrium, and rationalizability. It also covers the value of information and rational inattention, in both single-decision settings and interactive environments such as betting and repeated games.

The second part turns to models of information design and strategic communication. We study how information provision shapes beliefs and behavior in strategic environments, and analyze the incentives of privately informed agents to disclose information -truthfully or not- either directly or through a mediator.

Key Topics: Modeling Information and knowledge, solution concepts for normal form games, value of information, information design and persuasion, correlation and information in games, strategic information transmission.

Course organization - detailed outline:

Modeling Information and Knowledge

- States of nature and knowledge
- Interactive knowledge
- Beliefs and consensus

Solution concepts for normal form games: minmax, correlated equilibrium, rationalizable strategies

- Zero-sum games and the minmax theorem
- Correlated equilibrium
- Correlated rationalizability and common knowledge of rationality

Value of information

- One person decision problems: comparison of statistical experiments, rational inattention, Bayesian persuasion
- Bayesian Games
- Betting and no-trade theorem
- Repeated zero-sum games, optimal information revelation

Information Design and Bayesian Persuasion: Belief-Based Approach

- Bayesian persuasion: The single decision-maker case
 - Statistical experiments
 - Splitting lemma
 - Concavification
 - Examples
- Public persuasion in games
- Persuasion with belief-dependent preferences

Information Design, Bayes-Correlated Equilibrium and Private Persuasion: Outcome-Based Approach

- Contracts and correlated Strategies
- Correlated equilibrium, canonical representation
- Coarse correlated equilibrium
- Bayes-correlated equilibrium
- Examples

Cheap Talk Communication

- Examples
- Geometric characterization of equilibrium payoffs
- Transparent motives and connections to Bayesian persuasion
- Mediated communication equilibrium

ESG-related Content:

Environmental-related content	Social-related content	Governance-related content
Minimal content	Moderate content	Moderate content

Competency Goals:

Transformative Management	Innovative Thinking & Problem Solving	Positive Leadership	Sustainable Business Practices
Minimal contribution	Extensive contribution	Minimal contribution	Minimal contribution

TEACHING MATERIALS

Reading notes and slides.

TEACHING METHODS

Presentation and exercises with slides and on the blackboard.

COURSEWORK & EVALUATIONS

Work requested: Learn the concepts studied during the class and solve some exercises

Tool/method of evaluation	Duration	Weight in the final grading
Final exam	2h00 individual	100%

BIOGRAPHY

Frederic Koessler is research director at the French National Center for Scientific Research (CNRS). He is CNRS researcher at GREGHEC and professor at the department of Economics and Decision Sciences at HEC Paris since 2022. He is working on game theory and economics of information, especially on strategic information disclosure, persuasion, information and mechanism design, and behavioral game theory. His research in economic theory has been rewarded by a CNRS bronze medal in 2010. Frederic Koessler is actually associate editor at Games and Economic Behavior and Annals of Economics and Statistics.

Olivier Gossner is a specialist of Game Theory working at the intersection of Economics and Mathematics. His main research interests lie in repeated games, the strategic use of information, and bounded rationality. In recent work, he develops new models of strategic reasoning, and proposed a reform of Solvency II that would allow to allocate more insurance capital to the productive economy. He is a fellow and the vice president for communications of the Game Theory society.

ESTIMATED WORKLOAD

In addition to 24 hours of lectures, students should expect to spend approximately 10-30 hours on independent study - reviewing materials, solving exercises, and preparing for the final 2-hour written exam - depending on their background.