

**COURSE DATA****Data Subject**

<b>Code</b>	44958
<b>Name</b>	Game Theory and Economics of Information
<b>Cycle</b>	Master's degree
<b>ECTS Credits</b>	5.0
<b>Academic year</b>	2022 - 2023

**Study (s)**

<b>Degree</b>	<b>Center</b>	<b>Acad. year</b>	<b>Period</b>
2242 - M.D. in Economics	Faculty of Economics	1	First term

**Subject-matter**

<b>Degree</b>	<b>Subject-matter</b>	<b>Character</b>
2242 - M.D. in Economics	11 - Materia analítico-conceptual	Optional

**Coordination**

<b>Name</b>	<b>Department</b>
ALVENTOSA BAÑOS, ADRIANA	10 - Economic Analysis
URBANO SALVADOR, MARIA AMPARO	10 - Economic Analysis

**SUMMARY**

Game theory is the study of multiperson decision problems where there is a strategic conflict. That is, where participants are aware that the result or payoff they obtain depends not only on their own decisions but also on the decisions of other participants. Society in general, and the economy in particular, is plenty of these strategic interactions.

The first part of the course (*Game Theory*) covers the equilibria of strategic games with complete (review) and incomplete information, sequential games with complete information, bargaining and repeated games. Sequential games with incomplete information close the first part of the course.

In the second part (*Economics of Information*), the course studies canonical models of adverse selection and moral hazard. More specifically, we will look at how to design optimal contracts in the presence of asymmetric information. Contract theory is an important branch of applied microeconomic theory, and its tools are increasingly being used in labour and development economics, as well as industrial organisation. Thus, the course is of potential interest to those outside pure microeconomic theory.



## PREVIOUS KNOWLEDGE

### Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

### Other requirements

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## OUTCOMES

### 2242 - M.D. in Economics

- Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.
- Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.
- Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.
- Students should demonstrate self-directed learning skills for continued academic growth.
- Students should possess and understand foundational knowledge that enables original thinking and research in the field.
- Develop time management skills for learning: skills for organisation, planning and decision making in the process of learning advanced economics.
- Develop a critical capacity, show a research concern and interest in the field of economy, specialise in the use of bibliographical materials, in the use of economic databases and econometric, mathematical and statistical software. Also, learn to adequately disseminate research findings through scientific articles and presentations in congresses.
- Gain the capacities of abstraction and logical reasoning that are essential for the creation of economic models: ability to express oneself using formal, graphic and symbolic languages, to apply analytical and mathematical methods to economics, and to relate and manipulate concepts according to a purpose.
- Acquire linguistic and technological skills: ability to use English in the scientific field of economics and to use ICT in the field of economic study and research.
- Acquire social skills to work in a team: capacity to coordinate activities, ethical and responsible commitment, leadership and mobilisation capacity, all of which are important for economic and team management.



- Know how to promote, in academic and professional contexts, technological, social or cultural progress in a knowledge-based society that is founded on the respect for: (a) fundamental rights and the principles of equal opportunities for men and women, which involves using an inclusive and egalitarian language that promotes the visibility of women; (b) the principles of equal opportunities and universal accessibility for people with disabilities, and (c) the distinctive values of a culture of peace and democratic values.
- Communicate orally and in writing using an inclusive and egalitarian language.
- Know how to identify the relevant market and the competition model that is best suited to the strategic behaviour of the agents in the market.
- Know the role of the state in the analysis of markets and institutions.
- Know how to analyse the models of imperfect competition in the markets, both under certainty and under imperfect and incomplete information.
- Know the regulation of markets and the implementation of microeconomic policies

## LEARNING OUTCOMES

Competences and skills that will be acquired and learned during the course:

### General competences:

- This course aims to make the student familiar with a set of tools appropriate for strategic thinking and economic analysis.
- Set up and solve the most common decision problems economic agents face.
- Autonomous and group learning.
- Analyse economic problems with accuracy and rigour.

### Specific skills:

- To understand and analyse the agents' strategic behaviour in both static and dynamic scenarios.
- To analyse economic problems with an economic agents' strategic behaviour approach.
- To understand social phenomena such as conflict and cooperation, threats and credible promises, reputation, commitments, etc.
- To understand the economic behaviour of organisations.
- To understand and analyse the conflict of interests between individual and collective decisions in markets.
- To identify the relevant information and the precise characteristics. To evaluate the consequences of this problem from both sides of the market.
- To identify and evaluate the different solutions for a strategic problem.
- To develop Principal-Agent models of strategic behaviour.



## DESCRIPTION OF CONTENTS

### 1. BASIC IDEAS

- 1.1. What is a game?
- 1.2. What does game theory study?
- 1.3. Strategic thinking: some examples
- 1.4. Game Theory and Economics
- 1.5. Our strategy for studying games

### 2. SIMULTANEOUS-MOVE GAMES

- 2.1. The strategic form of a game
- 2.2. Dominant strategies: the prisoners' dilemma. Efficiency
- 2.3. The best-response function of a player
- 2.4. Mutual anticipation: successive elimination of dominated strategies

Applications: Private provision of a public good, effort incentives in a production team, second-price auctions.

### 3. NASH EQUILIBRIUM

- 3.1. The equilibrium of a game: definition and examples
- 3.2. Some simple properties of the equilibrium
- 3.3. The problem of multiplicity
- 3.4. Incentives in a team

Applications: Incentives and coordination in a production team, first-price auctions, duopoly and price competition, product differentiation.

### 4. SEQUENTIAL GAMES WITH PERFECT INFORMATION

- 4.1. The decision tree of a sequential game
- 4.2. Strategies and complete plans of actions
- 4.3. Sequential rationality and credible threats
- 4.4. Backward induction and perfect Nash equilibrium
- 4.5. Strategic moves: commitments, threats and promises



## **5. REPEATED GAMES**

- 5.1. Intertemporal preferences
- 5.2. Cooperation in a repeated prisoners' dilemma with infinite horizon
- 5.3. Finite repetition
- 5.4. The Folk Theorem

## **6. STATIC GAMES WITH PRIVATE INFORMATION. BAYESIAN GAMES**

- 6.1. Simultaneous games with private information
- 6.2. Types of players and private information
- 6.3. Bayesian Games and Bayesian Nash equilibrium
- 6.4. Applications

## **7. DYNAMIC GAMES WITH INCOMPLETE INFORMATION**

- 7.1. Dynamic games with asymmetric information
- 7.2. Beliefs and Bayesian updating
- 7.3. Behavioural strategies and consistency
- 7.4. Separating and pooling equilibria
- 7.5. Perfect Bayesian equilibrium and sequential equilibrium
- 7.6. Signaling game
- 7.7. Applications

## **8. INCENTIVES AND MORAL HAZARD**

- 8.1. The Principal-Agent model. Symmetric information. The optimal risk-sharing
- 8.2. The Principal-Agent model. Asymmetric information: incentives for a risk-averse agent
- 8.3. Extensions: risk neutrality, fines and supervision
- 8.4. Several agents. Team production
- 8.5. Moral hazard in some competitive markets: labour markets, insurance markets and credit markets

## **9. MARKETS WITH PRIVATE INFORMATION**

- 9.1. Adverse selection in markets with private information of quality
- 9.2. The Principal-Agent model with private information: discrimination and informational rents
- 9.3. Private information and competitive markets: unemployment and rationing
- 9.4. Quality signaling in markets
- 9.5. Private information and market entry deterrence
- 9.6. Repeated play and reputation



**WORKLOAD**

ACTIVITY	Hours	% To be attended
Theory classes	40,00	100
Classroom practices	10,00	100
Study and independent work	75,00	0
<b>TOTAL</b>	<b>125,00</b>	

**TEACHING METHODOLOGY**

The teaching methodology will be as follows:

1. Theory classes in the classroom.
2. Resolution of problem sets, elaboration of work topics, discussion and oral presentations, experimental work in the lab., etc.

**EVALUATION**

**SE.1 End of term exam:** 70% of final grade. This exam will consist on theoretical questions and solving practical problems.

**SE.2 Continuous Evaluation:** 30% of final grade. This evaluation is based on the interventions in lectures, solving individual problem sets and discussing practical exercises in the classroom. This is a non-recoverable activity and the grade of the Continuous Evaluation will be kept for the second call.

**REFERENCES****Basic**

- Vega Redondo, F. (2003): Economics and the Theory of Games. Cambridge University Press. Edición en castellano (2000). Economía y Juegos, Antoni Bosch.
- Gibbons, R. (1992): Game Theory for Applied Economists, Princeton Paperback. Traducción: Gibbons, R. (1992): Un primer curso de Teoría de Juegos, Antoni Bosch.
- Gibbons, R. , Un primer curso de teoría de juegos, Antoni Bosch, 1992.



- Watson, J. (2013) *Strategy: An Introduction to Game Theory*, W. W. Norton & Company; Third Edition.
- Laffont, J.J. and Martimort, D., (2002), *The Theory of Incentives: The Principal-Agent Model*, Princeton University Press.
- Macho, I. y Pérez Castrillo, D., *Introducción a la Economía de la Información*, Ariel, 2005.

#### **Additional**

- Mas-Colell, A., Whinston, M.D. y Green, J.R., *Microeconomic Theory*, Oxford: O.U.P., 1995.
- Fudenberg and Tirole (1991), *Game Theory*, MIT Press.