

Course Syllabus

Course 2014-15

Introduction to Game Theory (22102)

Department/Area of Study: Business Management and Administration, Economics

Course: second

Term: second

Number of credits ECTS: 6

Hours dedicated by students : 150

Language: Català/English

Professor: Xavier Calsamiglia, Helena Perrone

1. Course description

- **Objectives:** The objective of the course is to provide an introduction to Game Theory. Game Theory is a method to analyze how to make choices when others are also making choices at the same time. Learning Game Theory provide insights about how to strategically fix prices, or how prepare a negotiation, or understanding the difficulties of group cooperation, or where to locate a company, or what is the role of incentives in big corporations, among many other topics. Game theory allows you to calculate the possible advantage of moving first, or the credibility of threats, and the mechanisms to maintain cooperation alive. Rather than learning new things, students will learn to think strategically, a skill that can only be mastered with lots of practice.
- **Applications:** Most of the applications that we will cover will be in the area of economics and management. However, the theory has been successfully applied to sociology, biology, political science and many other fields.
- **Requirements:** The course takes a deeper look at some of the topics already introduced in *Introduction to Economics*. Game theory allows the students to make objective and rigorous theoretical analysis of specific economic situations. The previous knowledge required to follow this class are divided into two parts:
 - o *Knowledge of basic mathematics:* Algebra, Functional Analysis, Probability, Optimization. Most of this knowledge is basic, and students have acquired it before University. Other parts they have learned during the first term at the University in the courses of Mathematics and Data Analysis.
 - o *Knowledge of economics:* Though not obligatory the basic knowledge acquired during the course *Introduction to Economics* and *Microeconomics I* offers an interesting basis for the Game Theory course. In *Introduction to Economics* and *Microeconomics* students are introduced to the process of formalizing economic phenomena, a process that in the Game Theory course is extended to situations of strategic interaction.

2. Competences to be attained

<i>General competences</i>	<i>Special competences</i>
<ul style="list-style-type: none"> • Have consolidated habits of self-discipline, self-demand and rigor in the conduct of academic work, its organization and its proper timing. • Be proactive in the desire to know what is ignored, essential in any learning process and in any professional activity with projection. • Being able to apply flexibly and creatively the acquired knowledge and to adapt it to new situations and contexts. • Be able to progress independently and continuously in the training and learning processes • Understand the microeconomic strategies and their management implications • Use the appropriate information in the formulation of proposals and problem solving • Apply economic reasoning to decision making • To take decisions in high-risk situations • Apply knowledge and procedures relevant to a range of complex situations 	<ul style="list-style-type: none"> • Solve problems of management and leadership as occurring in a business company • Perform business consulting • Be able to successfully negotiate favorable and sustainable agreements • Be able to design economic and social programs that meet the needs for improving the living conditions of society: education, equality, welfare, environmental management, etc. • Perform economic and financial consulting • Develop studies of economic analysis for the research services of both business and financial groups and the public authorities.

3. Contents

1. Decision theory
2. Sequential games with perfect information: backward induction
3. Simultaneous games: dominance, iterated dominance, and pure best response
4. Nash equilibrium I: pure strategies
5. Zero-sum games: secure strategy, minmax theorem, value of a game
6. Nash equilibrium II: mixed strategies, games with a continuum of strategies
7. Sequential games without perfect information: subgame perfect equilibrium
8. Applications

4. Evaluation

- **Continued Obligatory Assessment:**
 - a) *Experiments* (10 points): Before the class sessions students have to participate in experiments using the Global Campus. Experiments consist in acting as a player in a game theoretic situation, and playing against the rest of the class . **Experiments are evaluated exclusively on the basis of the remunerations obtained during the game.**
 - b) *Participation in lectures and seminars*(10 points): 1 point will be awarded for attending a seminar. Three additional points can be obtained by remarkable participation in the solution of problem sets and practical cases. Negative points can be given for bad behavior (talking in class, being late, and other types of missbehaviour)
- **Final Obligatory Exam** (80 points): A passing grade in the course requires a minimum of 33 over 80 points in the final exam.

Resit examination system

There will be a recovery exam in the period indicated in the Faculty's academic calendar for students that have participated in the required learning and assessment activities during the quarter and been given a "fail" grade.

Participation is limited only to those students who:

1. Have not missed three or more seminars.
2. Have obtained a final exam grade above 20 over 80 points in the final exam.

Students enrolled in mobility programs recognized by the Faculty should notify the professor during the first two weeks of the quarter to be eligible for an alternative evaluation final exam.

5. Bibliography and didactic materials:

5.1. Basic bibliography

Avinash Dixit, Susan Keath, David H. Reiley, *Games of Strategy, 3rd Edition, W. W. Norton, London, 2009.*

5.2. Additional bibliography

Michael Maschler, Eilon Solan, and Shmuel Zamir, *Game Theory*, Cambridge University Press, 2013

Avinash K. Dixit y Barry J. Nalebuff, *The Art of Strategy: A Game Theorist's Guide to Success in Business and Life*, Norton, 2008

5.3. Didactic Resources

For each of the nine chapters, there is an important set of didactic material that will be available every week in the Global Campus.

- Experiments through the Internet
- Exercises and problems
- Practical cases

6. Methodology

During the course the following activities will be carried out

- a) Participation in internet experiments where students take decisions in a context of strategic interaction. Previous theoretical knowledge is not required.
- b) Theoretical sessions in a big group to introduce the concepts and their basic applications. Theoretical concepts are employed to discuss the behavior observed in the experiments.
- c) Seminar sessions in a small group where different concepts introduced during the course are discussed in an interactive way.
- d)

7. Outline of the seminars

Nº	Week	Seminar
1.	January 14 or 15	There is none.
2.	January 21 or 22	There is none.
3.	January 28 or 29	1. Decision theory
4.	4 or 5 de February	2. Sequential games with perfect information: backward induction
5.	11 or 12 de February	3. Simultaneous games: dominance, iterated dominance, and pure best response
6.	18 or 19 de February	4. Nash equilibrium I: pure strategies.
7.	25 or 26 de February	5. Zero-sum games
8.	4 or 5 de March	6. Nash equilibrium II: mixed strategies, continuum games
9.	11 or 12 de March	7. Sequential games without perfect information: subgame perfect equilibrium