# Course Syllabus

***Course 2011-12***

# Introduction to Game Theory (22102) (22103)

**Department/Area of Study:** Business Management and Administration, Economics, International Business Economics
**Course:** second
**Term:** second
**Number of credits ECTS:** 6
**Hours dedicated by students :** 150
**Language:** català/english
**Professor:** Xavier Calsamiglia, Fabrizio Germano, 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. It is not about winning in table games or playing cards. Instead, Game Theory is 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, the strategic importance of having a last encounter, 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:
    - *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.
    - *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

| *General competences* | *Special competences* |
|---|---|
| • Have consolidated habits of self-discipline, self-demand and rigor in the conduct of academic work, its organization and its proper timing.<br>• Be proactive in the desire to know what is ignored, essential in any learning process and in any professional activity with projection.<br>• Being able to apply flexibly and creatively the acquired knowledge and to adapt it to new situations and contexts.<br>• Be able to progress independently and continuously in the training and learning processes<br>• Understand the microeconomic strategies and their management implications<br>• Use the appropriate information in the formulation of proposals and problem solving<br>• Apply economic reasoning to decision making<br>• To take decisions in high-risk situations<br>• Apply knowledge and procedures relevant to a range of complex situations | • Solve problems of management and leadership as occurring in a business company<br>• Perform business consulting<br>• Be able to successfully negotiate favorable and sustainable agreements<br>• 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.<br>• Perform economic and financial consulting<br>• 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:* Before the class sessions or the seminars, 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) *Practical exercises:* solving problem sets and practical cases **for the seminars**. Attendance to the seminar is obligatory. Missing more then two seminars will automatically result in a **failing** grade. Seminar exemptions can be granted only for medical reasons.

- **Final Obligatory Evaluation**. A passing grade in the course requires a minimum of 40 over 100 points in the final exam.

Relative weight for each activity:

- Experiments 10%
- Exercises, practical cases and seminar participation 20%
- Final exam 70%

The evaluation in September will follow the same pattern used in June.

# 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

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 Recourses

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.

# 7. Outline of the seminars

| № | Week | Seminar |
|---|---|---|
| 1. | From 9/01 to 13/01 | There is none. |
| 2. | From 16/01 to 20/01 | There is none. |
| 3. | From 23/01 to 27/01 | 1. Decision theory |
| 4. | From 30/01 to 3/02 | 2. Sequential games with perfect information: backward induction |
| 5. | From 6/02 to 10/02 | 3. Simultaneous games: dominance, iterated dominance, and pure best response |
| 6. | From 13/02 to 17/02 | 4. Nash equilibrium I: pure strategies |
| 7. | From 20/02 to 24/02 | There is none. |
| 8. | From 27/02 to 02/03 | 5. Zero-sum games |
| 9. | From 5/03 to 09/03 | 6. Nash equilibrium II: mixed strategies, continuum games |
| 10. | From 12/03 to 16/03 | 7. Sequential games without perfect information: subgame perfect equilibrium |