



Game Theory

Syllabus

Course code:	6378
Number of ECTS credits:	3
Semester:	1st (September-January)
Recommended components:	Some standard knowledge of Calculus and Algebra and a small amount of elementary Probability Theory is required.
Language of instruction:	Spanish (students are allowed to ask questions and write homeworks and exams in English)

Course description

Game Theory studies some situations in which there are conflicts of interest between different people or teams.

Game Theory is, after all, a mathematical description of certain sociological phenomena. In choosing the material to be presented in this course, the main motivation has been the presentation of game-theoretic ideas to the graduate students. In order that the course can be followed by as wide a range of students as possible, a “low-profile” syllabus has been devised, requiring only some standard background in Calculus, Algebra and Probability.

Learning outcomes and competences

After completion of this course you will:

1. understand the notion of game and related basic notions.
2. know how to model some social phenomena using game theory.
3. understand the notion of mixed strategy and saddle point.
4. be able to solve some simple examples of two-person zero-sum games.
5. know the basic properties of finite games, together with the Fundamental Theorem of finite games.
6. study some methods to solve games.
7. get some elementary knowledge of the set of solutions of a game.

Course contents

- I. Preliminary notions from Game Theory
Basic notions. Games in Normal Form. Games in Extensive Form.
- II. Two-Person Games
Two-person zero-sum games. Games with an equilibrium point. Optimal strategies.
- III. Mixed extension of a game
Mixed extension of a rectangular game. Mixed extension of a finite game.
- IV. Fundamental theorem of finite games
Convexity. Fixed point theorem. Fundamental theorem of finite games. Properties of the set of solutions.
- V. Methods to solve games
Some cases of easy solution. Domination in finite games. Transformation in rectangular games.
- VI. Set of solutions
Extreme points of the set of solutions. Solution of a finite rectangular game.

References

1. Binmore, k. *Teoría de Juegos*; McGraw-Hill, 1993.
2. Ferguson, T.S. *Game Theory*; Mathematics Department, UCLA, 2014.
3. González-Díaz, J., García-Jurado, I. & Fiestras-Janeiro, M.G. *An Introductory Course on Mathematical Game Theory*; Graduate Studies in Mathematics.vol 115. American Mathematical Society. Real Sociedad Matemática Española, 2010.
4. Owen, G. *Game Theory*; Springer Verlag, 1968.
5. Washburn, A. *Two-person zero-sum games*; Informs. Springer, 2014.