# Game Theory

## Prof. Stefano Colombo

***COURSE AIMS AND INTENDED LEARNING OUTCOMES***

The course aims at providing a solid basis about the methodological approach of modern game theory, focusing on essential tools for economic analysis. A particular emphasis is placed on the decision making of economic agents, in conditions of both certainty and uncertainty, the analysis of the main market structures, and the strategic interaction between rational agents. Economic and financial applications of game theory are used both to ease the comprehension of formal models, and to illustrate a variety of situations whose understanding is greatly enhanced by the use of the tools introduced in the course.

At the end of the course students are expected to learn:

* basic concepts of game theory
* how to apply game theory to economic and financial questions.

***COURSE CONTENT***

* 1. *Strategic behavior and rationality: static games with perfect information*
* Games in strategic form with perfect information.
* Dominant strategies.
* Iterated elimination of strictly dominated strategies.
* Nash equilibrium.
* Best response functions.
* Mixed strategies Nash equilibrium.
  1. *Dynamic games with perfect information*
* Representation of a game in extended form.
* Subgame perfect Nash equilibrium.
* Backward induction.
* Bargaining as a game in extended form.
* Finitely and infinitely repeated games.
* The sustainability of collusive agreements: subgame perfect equilibria in infinitely repeated games.
  1. *Static and dynamic games with incomplete information*
* Bayesian Nash equilibrium.
* The signalling principle.
* Beliefs and sequential equilibria.
* Subgame perfect Bayesian Nash equilibrium.
* Signalling games.

***READING LIST***

M.J. Osborne, *An introduction to Game Theory*. Oxford University Press, last edition.

***TEACHING METHOD***

The course is based on theoretical lectures.

***ASSESSMENT METHOD AND CRITERIA***

The final exam is written. The test habitually consists of four questions that aim to verify students' level of understanding of game theory notions and their applications.

To pass the exam at least two out of the four answers must meet the standard requirements.

***NOTES AND PREREQUISITES***

Before enrolling in the course, the student should have developed a good basic understanding of modern microeconomic theory and the fundamental instruments of mathematical analysis. In particular, the student should be familiar with fundamental elements of:

* the theory of individual choice within strategic frameworks and in conditions of uncertainty (expected utility and risk aversion);
* the theory of the firm and of market structure (perfect competition, oligopoly, and monopoly);
* welfare economics and efficiency, public goods and externalities;
* differential calculus for functions with one or more variables and properties of the equations most frequently used in economic analysis (linear, quadratic and more in general, polynomial, logaritmic and exponential);
* static optimisation for functions with two or more variables, in the presence of equality and inequality constraints;
* probability theory (basic concepts)

Prof. Stefano Colombo receives students on Thursdays from 4 to 5 p.m. at his studio (via Necchi, 5, 2nd floor, office no. 203).