# Games and Equilibria

| Course title - Intitulé du cours | Games and Equilibria |
|---|---|
| Level / Semester - Niveau /semestre | M1 / S2 |
| School - Composante | Ecole d'Economie de Toulouse |
| Teacher - Enseignant responsable | GENSBITTEL FABIEN |
| Lecture Hours - Volume Horaire CM | 30 |
| TA Hours - Volume horaire TD | |
| TP Hours - Volume horaire TP | 0 |
| Course Language - Langue du cours | Anglais |
| TA and/or TP Language - Langue des TD et/ou TP | Anglais |

**Teaching staff contacts - Coordonnées de l'équipe pédagogique :**

Fabien Gensbittel (Office T581, e-mail: fabien.gensbittel@ut-capitole.fr).

Please address your questions by email or at the end of the class, and if necessary by appointment.

**Course's Objectives - Objectifs du cours :**

The course will first introduce the general model of static non-zero sum games and the classical notions of solutions (Dominated strategies, Nash equilibrium and some refinements). In this first part, we will present major mathematical results such as fixed points theorems (Brouwer, Kakutani) leading to existence theorems for Nash equilibria, and also practical methods of computations for Nash equilibria in finite and infinite games through several examples.

In a second part, we will introduce the model of extensive form games and the notions of: behavioral strategies, games with perfect information and backward induction, subgame perfection, perfect bayesian equilibrium, sequential equilibrium. In the third part of the course, we introduce the notion of correlated equilibrium. At the end of the course, a precise and rigorous knowledge of the fundamental mathematical methods for the study of interaction models (non-zero sum games) is expected; in particular computing all types of equilibria in finite or infinite (e.g. auctions models) games and applying theoretical methods (fixed points, finite dimensional analysis) to prove qualitative results (existence of refinements, uniqueness, relations between different notions of solutions, etc..).

**Prerequisites - Pré requis :**

Undergraduate courses in Probability theory and Analysis.

Courses Strategic Optimization and Advanced Analysis during the first semester.

**Practical information about the sessions - Modalités pratiques de gestion du cours :**

Lecture notes and corrected exercises will be posted on moodle.

**Grading system - Modalités d'évaluation :**

Midterm (40%) and final exam (60%).

**Bibliography/references - Bibliographie/références :**

Gonzalez-Diaz J., Garcia-Jurado I. and M. Fiestras-Janeiro, *An Introductory Course on Mathematical Game Theory*, Graduate Studies American Mathematical Society 2010.

Maschler M., Solan E. and S. Zamir, *Game Theory*. Cambridge UP 2013.

Myerson R., *Game Theory: Analysis of Conflict.*, Harvard University Press, 1991.

Laraki R., Renault J. and S. Sorin, *Bases mathématiques de la théorie des jeux (in French)*, Editions de l'Ecole Polytechnique 2013.

**Distance learning – Enseignement à distance :**

Depending on the general organization of the master decided by the school, this class might be partially or totally organized online: - detailed lecture notes provided - interactive questions and answers sessions online - multiple-choice questions and exercises online.