Game Theory (Théorie des jeux)

Course title - Intitulé du cours	Game Theory – Théorie des jeux
Level / Semester - Niveau /semestre	M1 / S1
School - Composante	Ecole d'Economie de Toulouse
Teacher - Enseignant responsable	Bertrand GOBILLARD
Other teacher(s) - Autre(s) enseignant(s)	
Other teacher(s) - Autre(s) enseignant(s)	
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Other teacher(s) - Autre(s) enseignant(s)	
Lecture Hours - Volume Horaire CM	30
TA Hours - Volume horaire TD	12
TP Hours - Volume horaire TP	0
Course Language - Langue du cours	English (international track) French (standard track)
TA and/or TP Language - Langue des TD et/ou TP	Anglais

Teaching staff contacts - Coordonnées de l'équipe pédagogique :

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Teaching assistants: Munoz Sobrado Esteban, Li Yaxin, Huang Dakang, Maxim Sandiumenge I Boy, Amirreza Ahmadzadech.

Course's Objectives - Objectifs du cours :

Objectives. The game theory class is an introductory course to Economic theory, namely the analyse of economic problems using theoretical arguments, with a focus on the modelisation and study of situations with strategic interaction. Its objective is twofolds. A broad first objective is to introduce students to important concepts in microeconomic theory / game theory and learn how to apply basic concepts in game / equilibrium theory and be more confortable with basic techniques and rigour used in (game) theory. On a more concrete level its purpose is to provide students with a solid skills base in game theory. The aim here is to provide rigorous foundations to the study of games, that have become an important aspect of modern microeconomics, and enable students to acquire knowledge and skills to apply this approach. At the end of the class it is expected students will be able to formalise an economic situation as a game and solve it using appropriate solution concepts and rigourous reasoning.

Course outline. The main tools of game theory are studied in turn: from static games under complete information to dynamic games under incomplete information. The course is illustrated with economic examples and applications, such as: Bertrand and Cournot models of competition, dynamic games of competition, bargaining games, signalling games, models of voting, collusion and repeated games, auctions, coordination games, bank runs, investment races; and so on.

To develop the theory and help students be more familiarized with the foundamental concepts, specific, first basic, examples will be used. Unfortunately we won't have time, during the lectures, to develop futher economic aspects of various classes of problems mentionned above. Nonetheless, to illustrate how all these tools can be used to study standard economic problems many such problems will be included in problem sets, that will also contain "more standard games" for practice (many examples of such "standard games" will in fact be included in the material used for the lectures, as well as short discussions and references to economics).

Students have access to a collection of problem sets with their solutions (available on the moodle page of the course). These problems are studied during the tutorials.

Part of the lectures are based on a set of "complementary slides" with examples, illustrations, and explanations on how to proceed to define and solve games. Those slides will be made available to students on the moodle page of the course (incrementally).

Slides containing the theoretical material taught during the lectures are also (already) at the disposal of the students on the moodle platform. The summary of their content is the following.

O. Defining and representing games (Normal form games, Mixed extension of a normal form game, Extensive form games, Extensive form and normal form); 3 - 4 lectures

I. Static games of complete information (Games under normal form, The notion of strict dominance, The best response correspondence and Nash equilibria in pure strategies, The mixed extension of a normal form game, The best response correspondence and Nash equilibria in mixed strategies, Link between Nash equilibria and strict dominance) ; 5 – 6 lectures.

II. Dynamic games of complete information (Games under extensive form, Extensive form and normal form, Nash equilibria and backward induction, Subgame perfect Nash equilibria) ; 5 - 6 lectures

III. Repeated games (Finitely repeated games, Infinitely repeated games), 4 – 5 lectures

IV. Games with incomplete information . 2 – 4 lectures

Prerequisites - Pré requis :

There is no prerequisite, apart from the most basic mathematical tools (derivatives and basic calculus), and a taste for rigorous reasoning.

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

(Normal organisation). Lectures: 30 hours, Language: English (2 classes) and French (1 class). Tutorials: 12 hours (7 "Standard sessions" and one "Question session"), Language: English. The organisation of the lectures is as follows: three lectures are taught each week during the first 2 weeks (Monday afternoon, Tuesday afternoon and Thursday afternoon), during the remaining 5 weeks there are two lectures taught on Monday and Thursday afternoon.

(Organisation under Covid measures). Due do Covid measures it is not possible this year to organize the teaching as usual. For this class, the prime idea is to have lectures taught on site, with the possibility for students to follow the lectures "100% on line" and switch from "online" to "onsite" mode of teaching depending on their personnal condition or situation. To include the possibility of "in-class teaching" in sufficiently small groups, allow for a reorganization that include a "D-group" where the course is taught 100% on line, and accommodate easily to "interactive online teaching" if the heath

situation worsens with more stringent Covid measures and the possibility of a new lockdown, main lectures will be organized as follows. It will be announced in advance which part of the theoretical material will be taught during a lecture. Students will have access to "student material", that corresponds to problems and questions that can be useful to prepare for the class. The study of these questions will then be discussed in class and provided to students in the format of slides (they will be part of the set of "complementary slides"). The general idea is that students should spend more time on the content material of a given class before going to class, and to compensate for this the time spent in class will be reduced accordingly. As for the schedule, during the first 5 weeks there will be two lectures per week (one lecture on Monday and one lecture on Thursday). During the following weeks there will be only one class taught on Monday. Finally additional classes might be added in the end of the semester if needed. The overall principle is that we will adapt (in the most appropriate manner possible).

Grading system - Modalités d'évaluation :

Midterm exam (20%) and final exam (80%).

Bibliography/references - Bibliographie/références :

There is no compulsory textbooks, but we would recommend:
Robert Gibbons, "A primer in Game Theory", Wheatsheaf Books, 1992; this book can also be found under the title "Game Theory for Applied Economists", Princeton University Press.
Steven Tadelis, "Game Theory: An Introduction", Princeton University Press.

More detailed and advanced material can be found in:
Martin Osborne and Ariel Rubinstein, "A course in Game Theory", The MIT Press,
Martin Osborne, "Introduction to Game Theory: International Edition", OUP Oxford,
Drew Fudenberg and Jean Tirole, "Game Theory", The MIT Press.