Aims

Game Theory uses mathematical models to study and analyse strategic interactions between agents. This course is designed to provide an understanding of the fundamental concepts in game theory as applied to economics in general and microeconomics in particular.

Learning Outcomes

Upon completion of the course students should:

- Become familiar with basic equilibrium concepts such as Nash equilibrium and subgame perfect equilibrium.
- Be able to solve for the equilibrium outcomes of simple games including the use of backward induction.
- Be able to write down the extensive form or normal form representations for simple games.
- Be able to use their knowledge of game theory in a wide variety of economic applications.
- Be able to understand and write clearly on the applications or extensions discussed during the course.

Course Delivery

The course will be delivered through a two-hour lecture and a one-hour seminar each week. Specific learning outcomes and prescribed reading are provided for each week of the course. Seminars will be based upon assigned problems distributed during the lecture. I will be available for consultation during advertised office hours or by appointment.

Assessment

- 2 on-line tests (1 hour each), which contribute 20% of the final grade (6th and 11th week, 10% each test).
- A 2-hour unseen final exam, which contributes 80% of the final grade.
- These exams will test your knowledge and understanding of the material covered in the course; your ability to apply models to ‘real’ economic situations; your ability to critically appraise models and their application.

Reading

The course does not follow one particular textbook. The textbooks that come closest to the course are:


Additional readings will be assigned from time to time. They are an integral part of the class and you are expected to read them.

**TIMETABLE**

Please note that the following *planned* lecture schedule is only indicative and changes are possible. It may be the case that more (or less) time needs to be spent on certain topics, so the actual lectures may not be in complete correspondence with the plan. Therefore, coverage of topics may sometimes overflow from one session to the other.

**Lecture 1: Dynamic games with complete information**

- Representation of games in extensive form
- Games of perfect and imperfect information
- Representation of games in strategic form.

By the end of this week you should be able to represent simple sequential games using extensive form.

**Lecture 2: Normal Form Games and Nash Equilibrium**

- Normal form representation of games
- Iterated elimination of strictly dominated strategies
- Motivation and definition of Nash Equilibrium

By the end of this week you should be able to define Nash equilibrium and explain several different motivations for it and find the Nash Equilibrium in simple games.

**Lecture 3: Normal Form Games: Applications**

- Cournot model of duopoly
- Bertrand model of duopoly
- Final offer arbitration
- The problem of the commons

By the end of this week you should be able to apply Nash equilibrium in oligopoly games and find the Nash equilibrium in other simple examples.

**Lecture 4: Advanced theory**

- Mixed strategies
- Existence of Nash equilibrium

By the end of this week you should be able to find a mixed strategy Nash Equilibrium of a game and explain why mixed strategies can be important in applications.

**Lecture 5: Dynamic games with complete and perfect information**

- Backward induction
- Stackelberg Model of duopoly
- Wage and employment in a unionized firm
- Sequential bargaining

By the end of this week you should be able to understand and apply backward induction in simple games.
Lecture 6 Dynamic games with complete but imperfect information

- Subgame Perfect Nash Equilibrium
- Bank Runs
- Tariffs and Imperfect International competition
- Tournaments

By the end of this week you should be able to understand the concept of subgame-perfect equilibrium and to find subgame perfect equilibria in simple examples.

Lecture 7 Extensive form games with perfect information, repeated games

- Two stage repeated games
- Infinitely repeated games
- Collusion between Cournot duopolist

By the end of this week you should be able to solve simple repeated games

Lecture 8 Static games with incomplete information

- Normal form representation of Statics Bayesian Games
- Bayesian Nash equilibrium

By the end of this week you should be able to understand the concept of a Bayesian game find the equilibrium of a Bayesian game

Lecture 9 Dynamic games with incomplete information

- Representation of dynamic games of incomplete information
- Introduction to Perfect Bayesian Equilibrium

By the end of this week you should be able to describe an extensive form game with incomplete information, understand the concept of perfect Bayesian equilibrium

Lecture 10 Extensive form games with incomplete information

- Signalling games and other applications

By the end of this week you should be able to understand the signalling problem and to find the perfect Bayesian equilibriums in simple games.