UNIVERSITY OF LONDON

Course information 2023-24

MT3040 Game theory (half course)

General information

COURSE LEVEL: 6

CREDIT: 15

NOTIONAL STUDY TIME: 150 hours

Summary

This half course is an introduction to the main concepts of non-cooperative game theory, and know how they are used in modelling and analysing an interactive situation.

Conditions

Prerequisite: If taken as part of a BSc degree, the following courses must be attempted before you can register on this course:

- MT2116 Abstract mathematics **AND**
- MT1174 Calculus **OR** MT1186 Mathematical methods **OR** (**BOTH** MT105a Mathematics 1 **AND**
- MT105b Mathematics 2)

Aims and objectives

This half course is designed to:

- familiarise students with formal methods for strategic analysis
- develop the mathematical theory of games as used in economics.

Learning outcomes

At the end of this half course and having completed the essential reading and activities students should have:

- knowledge of fundamental concepts of non-cooperative game theory
- the ability to apply solution concepts to examples of games, and to state and explain them precisely
- the ability to solve unseen games that are variants of known examples.

Essential reading

The subject guide itself is the essential reading for this course. Additional reading is recommended.

Assessment

This course is assessed by a two-hour and fifteen-minute closed-book written examination.

Syllabus

Please consult the current EMFSS Programme Regulations for further information on the availability of a course, where it can be placed on your programme's structure, and other important details.

This half-course is an introduction to game theory. At the end of this half-course, students should be familiar with the main concepts of non-cooperative game theory, and know how they are used in modelling and analysing an interactive situation. The key concepts are:

- Players are assumed to act out of self-interest (hence the term 'non-cooperative' game theory). This is not identical to monetary interest, but can be anything subjectively desirable. Mathematically, this is modeled by a utility function.
- Players should act strategically. This means that playing well does not mean being smarter than the rest, but assuming that everybody else is also 'rational' (acting out of self-interest). The game theorist's recommendation how to play must therefore be such that everybody would follow it. This is captured by the central concept of Nash equilibrium.
- It can be useful to randomise. In antagonistic situations, a player may play best by rolling a die that decides what to do next. In poker, for example, it may be useful to bet occasionally high even on a weak hand ('to bluff') so that your opponent will take the bet even if you have a strong hand.

Topics covered are:

- Combinatorial games and Nim.
- Game trees with perfect information, backward induction.
- Extensive and strategic (normal) form of a game.
- Nash equilibrium.
- Commitment.
- Mixed strategies and Nash equilibria in mixed strategies.
- Finding mixed-strategy equilibria for two-person games.
- Zero sum games, maxmin strategies.
- Extensive games with information sets, behaviour strategies, perfect recall.
- The Nash bargaining solution.
- Multistage bargaining.