# Course information 2026-27

# MT3040 Game Theory

## General information

**MODULE LEVEL:** 6

**CREDIT:** 15

**NOTIONAL STUDY TIME:** 150 hours

**MODE:** Locally Taught and Independent Learner Route (not available for Online Taught students)

## 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

Please refer to the relevant programme structure in the EMFSS Programme Regulations to check:
- where this course can be placed on your degree structure; and
- details of prerequisites and corequisites for this course.

You should also refer to the Exclusions list in the EMFSS Programme Regulations to check if any exclusions apply for this course.

## 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 the course and having completed the essential reading and activities students should be able to:
- 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.

## Employability skills

Below are the three most relevant employability skills that students acquire by undertaking this course which can be conveyed to future prospective employers:
1. Complex problem solving
2. Decision making
3. Adaptability and resilience

## 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

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.