

# EC220-15 Mathematical Economics 1A

**23/24**

**Department**

Economics

**Level**

Undergraduate Level 2

**Module leader**

Costas Cavounidis

**Credit value**

15

**Module duration**

10 weeks

**Assessment**

Multiple

**Study location**

University of Warwick main campus, Coventry

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## Description

### Introductory description

Mathematical Economics 1A, "Game Theory," is an introduction to the rigorous mathematical study of strategic interactions. Students will learn how game theorists model such interactions, and how those models can be analyzed. By the end of the module, they will have developed a formidable toolbox of game-theoretic techniques, and will be familiar with a variety of applications of these techniques to real-world situations, both economic and otherwise.

[Module web page](#)

### Module aims

Mathematical Economics 1a, "Introduction to Game Theory", aims to provide a basic understanding of pure game theory and also introduce the student to a number of applications of game theory to economic problems of resource allocation.

### Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

The module will typically cover the following topics: Games in strategic form: Nash equilibrium and

its applications to voting games, oligopoly, provision of public goods. Games in extensive form: sub game perfect equilibrium and its applications to voting games, repeated games. Static games with incomplete information: Bayesian equilibrium and its applications to auctions, contracts and mechanism design. Dynamic games of incomplete information: Perfect Bayesian equilibrium, Sequential equilibrium and its application to signalling games. Bargaining theory: Nash bargaining, non-cooperative bargaining with alternating offers and applications to economic markets. Evolutionary Game Theory

## **Learning outcomes**

By the end of the module, students should be able to:

- Subject Specific and Professional Skills:...demonstrate understanding of the tools of game theory, and the ability to apply them to wide classes of problems. The teaching and learning methods that enable students to achieve this learning outcome are: Lectures, seminars, guided reading and independent study. The summative assessment methods that measure the achievement of this learning outcome are: Tests and examination

## **Indicative reading list**

Please see Talis Aspire link for most up to date list.

[View reading list on Talis Aspire](#)

## **Subject specific skills**

Students will have the opportunity to develop skills in:

Analytical thinking and communication

Analytical reasoning

Critical thinking

Strategic thinking

Problem-solving

Abstraction

Policy evaluation

Analysis of incentives

Concepts of Simultaneity and Endogeneity

Analysis of optimisation

Understanding of Uncertainty and Incomplete Information

## **Transferable skills**

Students will have the opportunity to develop:

Numeracy and quantitative skills

Written communication skills

Oral communication skills

Mathematical, statistical and data-based research skills

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# Study

## Study time

Type	Required
Lectures	20 sessions of 1 hour (13%)
Seminars	5 sessions of 1 hour (3%)
Private study	125 hours (83%)
Total	150 hours

## Private study description

Private study will be required in order to prepare for seminars/classes, to review lecture notes, to prepare for forthcoming assessments, tests, and exams, and to undertake wider reading around the subject.

## Costs

No further costs have been identified for this module.

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## Assessment

You do not need to pass all assessment components to pass the module.

Students can register for this module without taking any assessment.

### Assessment group DC

	Weighting	Study time
Test 1	20%	
Examination	80%	

- Answerbook provided by department
- Students may use a calculator

### Assessment group R1

	Weighting	Study time
Examination - Resit	100%	

- Answerbook provided by department

- Students may use a calculator

## **Feedback on assessment**

The Department of Economics is committed to providing high quality and timely feedback to students on their assessed work, to enable them to review and continuously improve their work. We are dedicated to ensuring feedback is returned to students within 20 University working days of their assessment deadline. Feedback for assignments is returned either on a standardised assessment feedback cover sheet which gives information both by tick boxes and by free comments or via free text comments on tabula, together with the annotated assignment. For tests and problem sets, students receive solutions as an important form of feedback and their marked assignment, with a breakdown of marks and comments by question and sub-question. Students are informed how to access their feedback, either by collecting from the Undergraduate Office or via tabula. Module leaders often provide generic feedback for the cohort outlining what was done well, less well, and what was expected on the assignment and any other common themes. This feedback also includes a cumulative distribution function with summary statistics so students can review their performance in relation to the cohort. This feedback is in addition to the individual-specific feedback on assessment performance.

[Past exam papers for EC220](#)

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## **Availability**

### **Pre-requisites**

Any of:

EC106-24 Introduction to Economics OR

EC107-30 Economics 1 OR

EC109-30 Microeconomics 1 OR

EC137-15 Economics 1: Micro

AND (FOR ECONOMICS STUDENTS ONLY)

EC121-12 Mathematical Techniques A AND

EC122-12 Statistical Techniques A AND

EC125-6 Computing and Data Analysis

OR

EC123-12 Mathematical Techniques B AND

EC124-12 Statistical Techniques B AND

EC125-6 Computing and Data Analysis

EC106 or EC107 for GL11 and other Maths students

To take this module, you must have passed:

- Any of
  - [EC106-24 Introduction to Economics](#)
  - [EC107-30 Economics 1](#)
  - [EC109-30 Microeconomics 1](#)
  - [EC137-15 Economics 1: Micro](#)
- All of
  - [EC121-12 Mathematical Techniques A](#)
  - [EC122-12 Statistical Techniques A](#)
  - [EC125-6 Computing and Data Analysis](#)
- All of
  - [EC123-12 Mathematical Techniques B](#)
  - [EC124-12 Statistical Techniques B](#)
  - [EC125-6 Computing and Data Analysis](#)

## Post-requisite modules

If you pass this module, you can take:

- EC331-30 Research in Applied Economics
- EC331-30 Research in Applied Economics
- EC341-15 Mathematical Economics 2: Mechanism Design and Alternative Games
- EC341-15 Mathematical Economics 2: Mechanism Design and Alternative Games
- EC341-15 Mathematical Economics 2: Mechanism Design and Alternative Games
- EC334-15 Topics in Financial Economics: Corporate Finance and Markets
- EC301-15 Mathematical Economics 2: Dynamics, Uncertainty & Asymmetrical Information
- EC301-15 Mathematical Economics 2: Dynamics, Uncertainty & Asymmetrical Information
- EC301-15 Mathematical Economics 2: Dynamics, Uncertainty & Asymmetrical Information

## Courses

This module is Core optional for:

- Year 2 of UMAA-GL11 Undergraduate Mathematics and Economics
- Year 2 of UECA-GL12 Undergraduate Mathematics and Economics (with Intercalated Year)
- USTA-Y602 Undergraduate Mathematics, Operational Research, Statistics and Economics
  - Year 2 of Y602 Mathematics, Operational Research, Stats, Economics
  - Year 2 of Y602 Mathematics, Operational Research, Stats, Economics

This module is Optional for:

- TECA-L1PA Postgraduate Taught Economics (Diploma plus MSc)
  - Year 1 of L1PA Economics (Diploma plus MSc)
  - Year 1 of L1PA Economics (Diploma plus MSc)
  - Year 2 of L1PA Economics (Diploma plus MSc)
  - Year 2 of L1PA Economics (Diploma plus MSc)

- UECA-3 Undergraduate Economics 3 Year Variants
  - Year 2 of L100 Economics
  - Year 2 of L100 Economics
  - Year 2 of L100 Economics
  - Year 2 of L116 Economics and Industrial Organization
  - Year 2 of L116 Economics and Industrial Organization
- UECA-4 Undergraduate Economics 4 Year Variants
  - Year 2 of LM1H Economics, Politics & International Studies with Study Abroad
  - Year 2 of LM1H Economics, Politics & International Studies with Study Abroad
- UECA-LM1D Undergraduate Economics, Politics and International Studies
  - Year 2 of LM1D Economics, Politics and International Studies
  - Year 2 of LM1D Economics, Politics and International Studies
- UPHA-L1CA Undergraduate Economics, Psychology and Philosophy
  - Year 2 of L1CA Economics, Psychology and Philosophy
  - Year 2 of L1CC Economics, Psychology and Philosophy (Behavioural Economics Pathway)
  - Year 2 of L1CD Economics, Psychology and Philosophy (Economics with Philosophy Pathway)
  - Year 2 of L1CE Economics, Psychology and Philosophy (Philosophy and Psychology Pathway)
  - Year 3 of L1CA Economics, Psychology and Philosophy
  - Year 3 of L1CC Economics, Psychology and Philosophy (Behavioural Economics Pathway)
  - Year 3 of L1CD Economics, Psychology and Philosophy (Economics with Philosophy Pathway)
  - Year 3 of L1CE Economics, Psychology and Philosophy (Philosophy and Psychology Pathway)
- UPHA-L1CB Undergraduate Economics, Psychology and Philosophy (with Intercalated Year)
  - Year 4 of L1CG Economics, Psychology and Philosophy (Behavioural Economics Pathway) (with Intercalated Year)
  - Year 4 of L1CH Economics, Psychology and Philosophy (Economics with Philosophy Pathway) (with Intercalated Year)
  - Year 4 of L1CJ Economics, Psychology and Philosophy (Philosophy and Psychology Pathway) (with Intercalated Year)
  - Year 4 of L1CB Economics, Psychology and Philosophy (with Intercalated Year)
  - Year 4 of L1CB Economics, Psychology and Philosophy (with Intercalated Year)
- Year 4 of UMAA-G105 Undergraduate Master of Mathematics (with Intercalated Year)
- Year 3 of UMAA-GL11 Undergraduate Mathematics and Economics
- Year 4 of UECA-GL12 Undergraduate Mathematics and Economics (with Intercalated Year)
- UPHA-V7ML Undergraduate Philosophy, Politics and Economics
  - Year 2 of V7ML Philosophy, Politics and Economics (Tripartite)
  - Year 2 of V7ML Philosophy, Politics and Economics (Tripartite)
  - Year 2 of V7ML Philosophy, Politics and Economics (Tripartite)
  - Year 3 of V7ML Philosophy, Politics and Economics (Tripartite)
  - Year 3 of V7ML Philosophy, Politics and Economics (Tripartite)

- Year 3 of V7ML Philosophy, Politics and Economics (Tripartite)
- UPHA-V7MM Undergraduate Philosophy, Politics and Economics (with Intercalated year)
  - Year 4 of V7MQ Philosophy, Politics and Economics (Bipartite) with Intercalated Year
  - Year 4 of V7MH Philosophy, Politics and Economics - Economics/Philosophy Bipartite (Economics Major) (with Intercalated year)
  - Year 4 of V7MI Philosophy, Politics and Economics - Philosophy/Economics Bipartite (Philosophy Major) (with Intercalated year)
  - Year 4 of V7MJ Philosophy, Politics and Economics - Philosophy/Politics Bipartite (with Intercalated year)
  - Year 4 of V7MG Philosophy, Politics and Economics - Politics/Economics Bipartite (Politics Major) (with Intercalated year)

This module is Unusual option for:

- UPHA-L1CA Undergraduate Economics, Psychology and Philosophy
  - Year 2 of L1CA Economics, Psychology and Philosophy
  - Year 3 of L1CA Economics, Psychology and Philosophy
- UPHA-V7ML Undergraduate Philosophy, Politics and Economics
  - Year 2 of V7MR Philosophy, Politics and Economics (Bipartite with Economics Major)
  - Year 2 of V7MP Philosophy, Politics and Economics (Bipartite)
  - Year 2 of V7MP Philosophy, Politics and Economics (Bipartite)
  - Year 2 of V7ML Philosophy, Politics and Economics (Tripartite)
  - Year 2 of V7ML Philosophy, Politics and Economics (Tripartite)
  - Year 2 of V7ML Philosophy, Politics and Economics (Tripartite)
  - Year 3 of V7MR Philosophy, Politics and Economics (Bipartite with Economics Major)
  - Year 3 of V7MP Philosophy, Politics and Economics (Bipartite)
  - Year 3 of V7MP Philosophy, Politics and Economics (Bipartite)
- UPHA-V7MM Undergraduate Philosophy, Politics and Economics (with Intercalated year)
  - Year 4 of V7MS Philosophy, Politics and Economics (Bipartite with Economics Major) (with Intercalated Year)
  - Year 4 of V7MS Philosophy, Politics and Economics (Bipartite with Economics Major) (with Intercalated Year)
  - Year 4 of V7MQ Philosophy, Politics and Economics (Bipartite) with Intercalated Year
  - Year 4 of V7MM Philosophy, Politics and Economics (Tripartite) (with Intercalated year)

This module is Option list A for:

- USTA-Y602 Undergraduate Mathematics, Operational Research, Statistics and Economics
  - Year 2 of Y602 Mathematics, Operational Research, Stats, Economics
  - Year 2 of Y602 Mathematics, Operational Research, Stats, Economics

This module is Option list B for:

- UMAA-G105 Undergraduate Master of Mathematics (with Intercalated Year)
  - Year 2 of G105 Mathematics (MMath) with Intercalated Year
  - Year 4 of G105 Mathematics (MMath) with Intercalated Year
- UMAA-G100 Undergraduate Mathematics (BSc)
  - Year 2 of G100 Mathematics

- Year 2 of G100 Mathematics
- Year 2 of G100 Mathematics
- Year 3 of G100 Mathematics
- Year 3 of G100 Mathematics
- Year 3 of G100 Mathematics
- UMAA-G103 Undergraduate Mathematics (MMath)
  - Year 2 of G100 Mathematics
  - Year 2 of G103 Mathematics (MMath)
  - Year 2 of G103 Mathematics (MMath)
  - Year 3 of G100 Mathematics
  - Year 3 of G103 Mathematics (MMath)
  - Year 3 of G103 Mathematics (MMath)
- UMAA-G106 Undergraduate Mathematics (MMath) with Study in Europe
  - Year 2 of G106 Mathematics (MMath) with Study in Europe
  - Year 3 of G106 Mathematics (MMath) with Study in Europe
- Year 2 of UMAA-G1NC Undergraduate Mathematics and Business Studies
- Year 2 of UMAA-G1N2 Undergraduate Mathematics and Business Studies (with Intercalated Year)
- USTA-GG14 Undergraduate Mathematics and Statistics (BSc)
  - Year 2 of GG14 Mathematics and Statistics
  - Year 2 of GG14 Mathematics and Statistics
- UMAA-G101 Undergraduate Mathematics with Intercalated Year
  - Year 2 of G101 Mathematics with Intercalated Year
  - Year 4 of G101 Mathematics with Intercalated Year
- UPHA-V7ML Undergraduate Philosophy, Politics and Economics
  - Year 2 of V7MP Philosophy, Politics and Economics (Bipartite)
  - Year 2 of V7MP Philosophy, Politics and Economics (Bipartite)

This module is Option list C for:

- UPHA-V7ML Undergraduate Philosophy, Politics and Economics
  - Year 3 of V7MP Philosophy, Politics and Economics (Bipartite)
  - Year 3 of V7MP Philosophy, Politics and Economics (Bipartite)
  - Year 3 of V7ML Philosophy, Politics and Economics (Tripartite)
  - Year 3 of V7ML Philosophy, Politics and Economics (Tripartite)
  - Year 3 of V7ML Philosophy, Politics and Economics (Tripartite)
- UPHA-V7MM Undergraduate Philosophy, Politics and Economics (with Intercalated year)
  - Year 4 of V7MS Philosophy, Politics and Economics (Bipartite with Economics Major) (with Intercalated Year)
  - Year 4 of V7MS Philosophy, Politics and Economics (Bipartite with Economics Major) (with Intercalated Year)
  - Year 4 of V7MQ Philosophy, Politics and Economics (Bipartite) with Intercalated Year
  - Year 4 of V7MM Philosophy, Politics and Economics (Tripartite) (with Intercalated year)

This module is Option list D for:

- UPHA-V7ML Undergraduate Philosophy, Politics and Economics



- Year 2 of V7MR Philosophy, Politics and Economics (Bipartite with Economics Major)
- Year 3 of V7MR Philosophy, Politics and Economics (Bipartite with Economics Major)