Universidad de Navarra

Game Theory

Guía docente 2025-26

PRESENTATION

- **Brief description of subject:** This subject presents the basic concepts of strategic analysis that game theory develops for students to being able to analyze situations of cooperation and conflict in economic environments.
- **Carácter**: Mandatory
- **ECTS**: 6
- **Curso y semestre**: 2nd year, 1st term
- **Idioma**: English
- **Título**: Game Theory
- **Módulo y materia de la asignatura**: I. General Economics, I.1 Microeconomics
- **Professor in charge of the subject**: Markus Kinateder (mkinateder@unav.es)
- Lecture rooms and detailed schedule: please see "Lectures"
  - **WARNING TO *EXCHANGE STUDENTS* (NOT FROM UNAV'S ECONOMICS DEGREE): This subject requires advanced knowledge of calculus, algebra and statistics and is more comparable to a 4th year (i.e., final year) subject at other universities. In the past, exchange students struggled to pass the subject.**

LEARNING RESULTS (Competences)

CG1 To be familiar with different areas of the theory and/or application of economic analysis.

CG7 To reach conclusions of a regulatory nature that are relevant to economic policy based on positive knowledge.

SC1 To be familiar with the fundamental concepts and methods of economic theory.

SC3 To use the concepts, theories and models of economic theory to assess the reality of the economic context.

SC10 To apply the tools of economic theory to the analysis and discussion of real situations.

PROGRAMME

Programme

1. Simultaneous move games and Nash equilibrium (Ch. 2&4)

1.1 Definition and basics

Rationality

Elements of a game (rules, strategies, payoff function)

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1.2 Types of strategies

Dominant strategies

1.3 Payoff Matrix

1.4 Nash equilibrium in pure strategies

1.5 Some Games

- Prisoner's Dilemma
- Chicken Game
- Hawk and Dove game
- Battle of sexes
- Others

1.6 Focal Points

2. Mixed and correlated strategies (Ch. 7)

2.1 Nash equilibrium in mixed strategies

2.2 Coordination devices

- Definition
- Correlated equilibrium

3. Sequential Games (Ch. 3)

3.1 Definition and basics

- Sequential rationality
- Elements of a sequential game (rules, strategies, payoff function)

3.2 Decision Trees

3.3 Subgame perfect equilibrium

- Backwards Induction
- Credible threats
- Comparison with Nash equilibrium (incredible threats)

3.4 Some Games

- Ultimatum Game
- Centipede Game

- Entry Game

4. Games with incomplete information (Ch. 9)

4.1 Definition and basics

- Rationality with incomplete information (beliefs)

- Elements of a game with incomplete information (rules, strategies, payoff function)

4.2 Simultaneous games of incomplete information

- Bayesian Nash equilibrium

4.3 Sequential games of incomplete information

- Forward induction

- Sequential equilibrium

5. Other equilibrium concepts

5.1 Stability of equilibrium

5.2 Trembling hand perfect equilibrium

5.3 Communication equilibrium

6. Repeated Games (Ch. 10)

6.1 Definition and basics

6.2 Finitely repeated games

6.3 Infinitely repeated games

6.4 Coordination in repeated games: Folk Theorem

7. Cooperative game theory

7.1 Definition and basics

- Rationality

- Elements of a game (rules, strategies, characteristic function)

7.2 Types of cooperative games

- Transferable utility (TU) games

- Non-transferable utility (NTU) games

7.3 Coalition formation

7.4 Core and Shapley value

8. Miscallaneous

8.1 Some applications of Game theory

- Oligopoly analysis

- Auctions (Ch. 15)

- Bargaining (Ch. 17)

- Simulations

8.2 Network economics

8.3 Evolutionary Game theory (Ch. 12)

8.4 Mechanism Design (Ch. 14)

In Spanish (for legal reference only - no worries the lecture and all the subject is entirely taught in English):

Tema 1: Juegos simultáneos y el equilibrio de Nash (NE)

1.1 Definiciones y supuestos básicos

- Racionalidad

- Elementos del juego (reglas, estrategias, función de pagos)

1.2 Tipos de estrategias

- Estrategias dominantes

1.3 Matrix de pagos

1.4 Equilibrio de Nash en estrategias puras

1.5 Juegos "tipo"

- Dilema del prisionero

- Juego del gallina

- Juego del halcón y la paloma

- Batalla de los sexos

- Otros (juegos sin equilibrio)

1.6 Puntos focales

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Tema 2: Estrategias mixtas y correlacionadas

2.1 Equilibrio de Nash en estrategias mixtas

2.2 Mecanismo aleatorio como coordinación

- Definiciones: mecanismo aleatorio

- Equilibrio correlacionado o correlado

Tema 3: Juegos secuenciales

3.1 Definiciones y supuestos básicos

- Racionalidad

- Elementos del juego (reglas, estrategias, función de pagos)

3.2 Árboles de decisión

3.3 Equilibrio perfecto en subjuego

- Inducción "hacia atrás"

- Amenazas creíbles

- Comparación con el Equilibrio de Nash

3.4 Juegos "tipo"

- Juego del ultimátum

- Juego del ciempiés

- Juego de entrada a mercado

Tema 4: Juegos con información incompleta

4.1 Definiciones y supuestos básicos

- Racionalidad con información incompleta

- Elementos del juego (reglas, estrategias, función de pagos)

4.2 Juegos con información incompleta simultáneos

- Equilibrio de Nash Bayesiano

4.3 Juegos con información incompleta secuenciales

- Creencias consistentes y racionalidad secuencial

- Inducción hacia delante

- Equilibrio secuencial

Tema 5: Otros conceptos de equilibrio

5.1 Equilibrios estables

5.2 Equilibrio perfecto de manos temblorosas

5.3 Equilibrios con comunicación

Tema 6: Juegos repetidos

6.1 Definiciones y supuestos básicos

6.2 Juegos repetidos finitos

6.3 Juegos repetidos infinitos

6.4 Coordinación repetida en juegos repetidos

- El teorema de la tradición oral

Tema 7: Teoría de juegos cooperativa

7.1 Definiciones y supuestos básicos

- Racionalidad

- Elementos del juego (reglas, estrategias, función característica)

7.2 Tipos de juegos cooperativos

- Juegos con transferencia de utilidad

- Juegos sin transferencia de utilidad

7.3 Formación de coaliciones

7.4 "Core" y valor de "Shapley"

Tema 8: Tópicos misceláneos

8.1 Aplicaciones usuales de la teoría de juegos

- Análisis de oligopolios

- Subastas

- Negociación

- Resolución de juegos en simuladores

8.2 Economía de redes

8.3 Juegos evolutivos

8.4 Diseño de mecanismos

LECTURES

Each week there are fours hours of lectures scheduled (lecture attendance is mandatory). (There is no video transmission of lectures, etc., all activities are on-site.)

Lectures include theoretical and exercise sessions, some of which will be prepared by the student beforehand.

Place and time: tba (Amigos bldg)

EVALUATION

WARNING TO EXCHANGE STUDENTS (NOT FROM UNAV'S ECONOMICS DEGREE): This subject requires advanced knowledge of calculus, algebra and statistics and is more comparable to a 4th year subject at other universities. Several Exchange students failed the subject in the past years.

All exams take place on-site. There is no possibility to do exams online.

Ordinary exam (Dec) weights of final grade:

20% Continuous evaluation: Miniexam (each counts 10%)

30% Midterm Exam

50% Final Exam

A student who does not hand in an exam when requested on the oficial examination date receives a NP (Not Present) that is equivalent to a 0 grade.

Extraordinary exam (June) weights of final grade:

20% Continuous evaluation: Miniexam (each counts 10%)

30% Midterm Exam

50% Final Retake Exam

In general, only the final exam is retaken in June by any student who fails the subject in the ordinary exam (Dec). The remaining grade (midterm and miniexams) corresponds to the one obtained in autumn and is maintained for the extraordinary exam date.

A student may request a change to this rule in the extraordinary exam at least 5 days before the extraordinary examination period starts under the following conditions:

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a) A student who passed the subject in December, may retake the subject in June. This request has to be made by instancia to Dirección de Estudios at least 5 days before the extraordinary examination period starts. (In this case, a student renounces on the grade in the ordinary exam and accepts receiving the one of the extraordinary examination as final grade of the subject whether it is better, the same or worse.)

b) Any student who participates in the extraordinary exam and does not want to follow the general examination mentioned before (that consists of retaking the final exam only, but maintaining the continuous evaluation and midterm exam grades) may request, by email to the professor, before the extraordinary examination period starts, to have an exam that consists of the final retake, the midterm, and the two miniexams, i.e. to retake all exams and obtain 100% of the grade in the extraordinary examination. These exams would then take place, one after another, according to the information provided about these exams here.

A student who does not hand in an exam when requested on the oficial examination date receives a NP (Not Present) that is equivalent to a 0 grade.

Dates and places (all lecture rooms are in Amigos Building, unless stated otherwise):

Miniexam I: tba, duration: 30 min

Miniexam II: tba, duration: 30 min

Midterm: tba, duration: 40 min

Final: tba, duration: 50 min

Retake exam: tba, duration: 50 min

OFFICE HOURS

Please contact me by email (mkinateder@unav.es) regarding the retake exam or if you are interested in mentoring/asesoramiento.

(Office: 2550, Amigos Bldg., Tower) tba

(Office Hours have to be booked in advance. A Google drive file (a couple of days before office hours take place) will be available to do so. Please respect this procedure.)

(In case all slots are booked, please be patient and come back half a day later, all office hour requests will be attended!!)

BIBLIOGRAPHY

Games of Strategy, by Avinash Dixit, Susan Skeath, David McAdams, Norton Find it in the Library

Please see the programme for references to which chapters to read.

(The book I use is the fifth and newest edition, though earlier editions will serve equally well, yet the references to the chapters may vary)

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