

COURSE OUTLINE

Course Code / Title : HE3032 Game Theory

Pre-requisites : a) HE2001 + HE1003

b) HE1003 + HE9092

c) HE1003 + HE5092

d) HE5092 + HE1004

e) HE2001 + HE1003

f) HE2001 + HE1004

No. of AUs. : 3

Contact Hours : 39

Course Aims

Game theory is the study of strategic interactive decision making. It is widely used in political science, psychology and evolutionary biology, and it is the dominant paradigm of modern economic analysis. The first part of this course introduces the central concepts and the tools of game theoretical analysis, and the second part focuses on the use of game theory in economics with applications drawn upon settings such as auctions, oligopoly and price wars, organizational design and labour contracts. The course is aimed at 3rd and 4th year students interested in using mathematical modeling to study economic questions.

Intended Learning Outcomes (ILO)

By the end of this course, you (as a student) would be able to:

1. Describe what is a “game” in the language of game theory and define the key ingredients of a game.
2. Transform an economic relationship between two or more parties into a “game” and analyze (i.e., make predictions) the relationship from the lens of game theory.
3. Explain the differences in the information structure of a game and categorize each game into a game of perfect information, imperfect information, complete information, or incomplete information.
4. Apply the appropriate equilibrium concept for games with different information structures.
5. Critically evaluate the predictions made by each equilibrium concept and identify its short-comings.

Course Content

1. Definition of a “game” and strategies.
2. Dominance solvable.
3. Static games of complete information: Nash equilibrium.
4. Dynamic games of complete information: subgame perfect Nash equilibrium.
5. Static games of incomplete information: Bayes Nash equilibrium (BNE).
6. Application of BNE: auctions.
7. Dynamic games of incomplete information: perfect Bayesian Equilibrium (PBE).
8. Application of PBE 1: strategic communication and persuasion.
9. Application of PBE 2: signaling and education.
10. Repeated games.

Course Assessment

Continuous Assessment (Test/Quiz) :	25%
Continuous Assessment (Take-home Assignments) :	10%
Continuous Assessment (Class Participation) :	15%
Continuous Assessment (Final Test/Quiz) :	50%

Total	100%

Reading and References

Gibbons, Robert. *A Primer in Game Theory*. MIT press, 1992.

This book covers many, but not all topics in the course. The book is optional.

NB: The above listing comprises the foundational readings for the course and more up-to-date relevant readings will be provided when they become available.

Course Instructors

Instructor	Office Location	Email
A/Prof Yuan Zhaoneng	SHHK	zhaoneng.yuan@ntu.edu.sg

Planned Weekly Schedule

Week	Topic	Course LO	Readings/ Activities
Week 1	Definition of games	1, 2, 3, 4, 5	Lecture notes
Week 2	Dominance solvable	1, 2, 3, 4, 5	Lecture. Lecture notes and homework exercises
Week 3	Pure strategy Nash equilibrium	1, 2, 3, 4, 5	Lecture. Lecture notes and homework exercises
Week 4	Mixed strategy Nash equilibrium	1, 2, 3, 4, 5	Lecture. Lecture notes and homework exercises
Week 5	Subgame perfect Nash equilibrium	1, 2, 3, 4, 5	Lecture. Lecture notes and homework exercises
Week 6	Bayes Nash equilibrium	1, 2, 3, 4, 5	Lecture. Lecture notes and homework exercises
Week 7	Midterm Quiz	1, 2, 3, 4, 5	Test. Lecture notes and homework exercises
Recess Week			
Week 8	Perfect Bayesian equilibrium (Part 1)	1, 2, 3, 4, 5	Lecture. Lecture notes and homework exercises
Week 9	Perfect Bayesian equilibrium (Part 2)	1, 2, 3, 4, 5	Lecture. Lecture notes and homework exercises
Week 10	Signaling models	1, 2, 3, 4, 5	Lecture. Lecture notes and homework exercises
Week 11	Repeated games	1, 2, 3, 4, 5	Lecture. Lecture notes and homework exercises
Week 12	Revision	1, 2, 3, 4, 5	Revision
Week 13	Final Test	1, 2, 3, 4, 5	Final Test

