Game Theory
Course Information

Instructor: Patroklos Benatos
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Office hours: By appointment, usually after class or over the internet.
Course page: https://pbenatos.web.elte.hu
Prerequisites: The course is a straightforward continuation of the one-semester introductory course at the BSM; it therefore uses the conceptual framework and the material covered in that course. The prerequisite is to have completed that course or a comparable course at your home institution.
In the latter case, first see the BSM Spring 2016 course description at http://www.bsmath.hu/16spring/GMTsyllabus.html and then contact me for an initial consultation.
The mathematical prerequisite is some mathematical maturity and good working knowledge of the *basic elements* of the following areas:

- naive set theory,
- finite dimensional real vector spaces,
- real analysis (with the basics of measure theory),
- probability theory (finite sample space is enough, though we might use the general case here and there).

Approach: The overall key characteristic of the course is the emphasis on the *depth of understanding* rather than on the quantity of material.
Text: The course does not follow any textbook but rather it is a mesh of several textbooks (see below) combined with the instructor's own approach as to how the material can be structured and explained.

Syllabus

The course concentrates on the **competitive** branch of game theory; **cooperative** game theory is only touched upon and has to be covered in another course. In addition to class notes from the instructor, we use various parts of the following textbooks:
Advanced undergraduate level:

- Ken Binmore: Fun and Games – a Text on Game Theory (D.C Heath 1992)
- Ken Binmore: Playing For Real (Oxford University Press 2007)
- Robert Gibbons: Game Theory for Applied Economists (Princeton University Press 1992)

Graduate level:

- Osborne – Rubinstein: A Course in Game Theory (MIT Press 1994)
- Roger B. Myerson: Game Theory – Analysis of Conflict (Harvard University Press 1991)

An excellent book for the mathematical tools (except for probability theory) is:

- Efe A. Ok: Real Analysis with Economic Applications (Princeton University Press 2007)

The planned list of topics is as follows (the list contains more that what can be reasonably achieved in the summer term; we will select topics from those listed 6-9):

1. Nash Equilibrium: the Original and the Modern Proof
Set-valued functions, continuity, Brouwer's and Kakutani's fixed point theorems. Games with player or strategy symmetries.

2. The Equilibrium Refinement and Selection Problem
Perfect, proper, persistent and stable sets of equilibria. Evolutionary stable strategies. General solution concept properties.

3. Rationalizability and Common Knowledge
The notion of rationalizability and its relation to dominance. The mathematical model of common knowledge.

4. Evolutionary Game Theory: Introduction
Myopic evolutionary models, Replicator Equation.

5. Extensive Games of Imperfect and Incomplete Information
Mixed and behavioral strategies, Kuhn's theorem. Sequential rationality and sequential equilibrium; relationship with trembling hand perfect equilibrium. Multi-agent representation of extensive games. Bayesian games. Signaling games.

6. Mechanism Design
Revelation principle, moral hazard, auction theory. Algorithmic game theory.

7. Repeated Games
Strategies, payoffs, folk theorems. Recursive and stochastic games: stationary strategies, Shapley's theorem.

8. Games with Communication
Correlated equilibrium, Two-person bargaining.

9. Coalitional Games
Characteristic function form. Stable sets, Core, Shapley value, Nucleolus.