SYLLABUS GAME THEORY, PHD (Lecture Nr. 432 902)

Course Weeks: 4.3.-8.3. and 25.3.-29.3.2019

Lecture dates and rooms: The lecture will take place from 11:00 am to 2:30 pm every course day. Here is a list with the lecture dates and rooms:

04.03. 11:00-14:30 SR 13
05.03. 11:00-14:30 SR 13
06.03. 11:00-14:30 SR 13
07.03. 11:00-14:30 SR 13
08.03. 11:00-14:30 SR 13

Midterm: Mo, March 25, 8:30-10:30 SR 13

25.03. 11:00-14:30 SR 13
26.03. 11:00-14:30 SR 13
27.03. 11:00-14:30 SR 13
28.03. 11:00-14:30 SR 13
29.03. 11:00-14:30 SR 13

Final: date and room still open

Contents: Below you find an outline of the contents of the course. The plan is to cover the contents of lectures 1 to 11 in week 1, and the contents of lectures 12 to 16 in week 2. If there is time left, there will be additional material on mixed topics (lectures 17-19).

The slides to lectures 1-16 comprise four solution concepts, which is all what you need for applied research.

*Nash Equilibrium (for static games with complete information)
*Subgame Perfect Nash Equilibrium (for dynamic games with complete information)
*Bayesian Nash Equilibrium (for static games with incomplete information)
*Perfect Bayesian Nash Equilibrium (for dynamic games with incomplete information)

Those who have some prior knowledge of game theory might wonder why Sequential Equilibrium (SE) is missing in this list. It is a good alternative for Perfect Bayesian Nash Equilibrium (PBNE) for analyzing dynamic games with incomplete information and the decision between SE and PBNE is a matter of taste. We have decided for PBNE because it is more intuitive and easier to apply (and we do not discuss both because PBNE and SE yield exactly the same prediction in most applications). There are, of course, many other equilibrium concepts out there, those mainly interested in applied work do not need to know them, though (at least this is my opinion).

Requirements:
Regular attendance in class: Regular attendance and participation in class is expected. If you cannot attend for any reason, please inform us per e-mail. Please don't provide any reasons, just inform us that you cannot attend.

Problem sets: To help you to gain ease in applying the tools of non-cooperative game theory, you are expected to work in small groups (comprising no more than four students each) on problem sets. There will be one problem set to each of the ten units. To give you the opportunity to work jointly on them, we have booked rooms also for the mornings and the afternoons of the lecture dates.

Participation in two written exams: The midterm takes place on Mo, March 25, 8:30-10:30 in SR 13 and covers the first 11 lectures. The final covers all lectures and the date and the room will be announced in the course.

Dates and venues for joint work on problem sets:

On the lecture days SR 13 is available for joint work on the problem sets also in the morning (as of 8:00) and in the afternoon (till 17:00). From 16:00 to 16.45 (roughly) one of us will be a around offering help.

You should be able to solve each problem set in two to three hours at the very most. Thus, there should be enough time left to catch up on previous material –or, even better– to take a first look at the concepts to come.

Those of you not familiar with the material covered in week 1 should start going over the slides before the course starts. We therefore attach the slides covered in week 1. Although the slides are pretty much self-contained, some of you might want to take a look at a textbook.

References:

A good reference is:

* Maschler, M., E. Solan and S. Zamir, Game Theory, Cambridge University Press.

“Classic" references for the graduate level are:

* Osborne, M. and A. Rubinstein, A Course in Game Theory, MIT Press

* Fudenberg, D. and J. Tirole, Game Theory, MIT Press.

* Myerson, R. B., Game Theory - Analysis of Conflict, Harvard University Press.

The contents of lectures 1 to 14 (although at a somewhat lower level) can also be found in:

* Gibbons, R., A Primer in Game Theory, Harvester/Wheatsheaf.

Most of the material covered in the course is also (to some extent) covered in:

* Mas-Colell, A., M. Whinston and J. Green, Microeconomic Theory, Oxford Univ. Press

Find all basic concepts also in:

* Osborne, M., An Introduction to Game Theory, Oxford Univ. Press.

Best,
Rudi (Kerschbamer) and Philipp (Plaickner)

Outline of Contents:

1. **Representation of Games**

   ***Lecture 1 Representation of Games*:** normal-form representation, extensive-form representation, information sets, random moves, histories, pure strategies, relationship between extensive-form and normal-form, mixed strategies and behavioural strategies

2. **Dominance**

   Lecture 2 Static Games of Complete Information - Dominance: (strictly) dominant strategies, (strictly) dominated strategies, iterated deletion of strictly dominated strategies, iterated deletion and rationality, mixed strategies and dominance, rationalizable strategies

3. **Static Games of Complete Information: Nash Equilibrium**

   Lecture 3 Static Games of Complete Information - Pure Strategy Nash Equilibrium in Finite Games: definition of Nash Equilibrium (NE), finding NE, best-response correspondences and NE, motivating NE, relation between NE and iterated deletion, existence of NE in pure strategies in finite games, multiplicity

   Lecture 4 Static Games of Complete Information - Mixed Strategy Nash Equilibrium in Finite (Discrete) Games: definition of mixed strategy NE, finding mixed strategy NE, mixed best-response correspondences and mixed NE, motivating mixed NE, existence of (possibly mixed) NE in finite games

   Lecture 5 Static Games of Complete Information - Nash Equilibrium in Infinite (Continuous) Games: finding NE in games with continuous strategy spaces, best-response correspondences and NE with continuous strategy spaces, strategic substitutes vs. strategic complements, applications in economics and finance, existence of NE in games with continuous strategy spaces

4. **Dynamic Games of Complete Information: Subgame Perfect Equilibrium**

   Lecture 6 Dynamic Games of Complete Information - Subgame Perfect Nash Equilibrium in Finite Games: incredible threats and incredible promises, subgames, definition of Subgame Perfect Nash Equilibrium (SPNE), finding SPNEs in games of perfect information (Backward Induction Procedure), finding SPNE in games of imperfect information (Generalized Backward Induction Procedure), NE versus SPNE, existence of SPNE in finite games

***Lecture 7 Dynamic Games of Complete Information - Subgame Perfect Nash Equilibrium in Continuous Games with Perfect Information*:** finding SPNE in continuous games of perfect information, SPNE outcome vs. SPNE, games of positive externalities vs. games of negative externalities, NEs of simultaneous-move vs. SPNE of sequential move games, costs and benefits of pre-commitment: first-mover advantage vs. second-mover advantage, strategic effect and direct effect of first-stage behaviour, applications

***Lecture 8 Dynamic Games of Complete Information - Subgame Perfect Nash Equilibrium in Continuous Games with Imperfect Information*:** finding SPNE in continuous games of imperfect information, strategic pre-commitments to affect future interactions, formal analysis of incentives for pre-commitment, strategic effects and direct effects, Tirole's animal terminology to characterize commitment strategies, a graphical analysis of pre-commitment effects

Lecture 9 Dynamic Games of Complete Information - Subgame Perfect Nash Equilibrium in Games with (Potentially) Infinite Sequences of Moves: finding SPNE in games with (potentially) infinite sequences of moves, motivation for repeated games, finitely and infinitely repeated games, finitely repeated games with unique and with multiple NE in stage-game, one-stage-deviation principle, infinitely repeated games and discounting, applications of infinitely repeated games (cooperation in social dilemmas, collusion), characterizing SPNE outcome paths in payoff space (folk theorems), infinite horizon, infinite action bilateral bargaining

5. Static Games of Incomplete Information: Bayesian Equilibrium

***Lecture 10 Static Games of Incomplete Information - Bayesian Equilibrium in Finite (Discrete) Games*:** incomplete information, Harsanyi transformation, definition of Bayesian Equilibrium (BE), finding BE in finite games, correlated types, applications, existence of BE in finite games BE

Lecture 11 Static Games of Incomplete Information - Bayesian Equilibrium in Infinite (Continuous Action and/or Continuous Type Spaces) Games: definition of BE in games with continuous action and/or continuous type spaces , finding BE in games with continuous action and/or continuous type spaces, Cournot with asymmetric information on cost, purification of mixed strategies, first price auction

6. Dynamic Games of Incomplete Information: Perfect Bayesian Equilibrium

***Lecture 12 Dynamic Games of Incomplete Information - Perfect Bayesian Equilibrium in Finite Games*:** motivation for definition of Perfect Bayesian Equilibrium (PBE), elements of PBE, definition of PBE, finding PBE, applications

***Lecture 13 Dynamic Games of Incomplete Information - Perfect Bayesian Equilibrium in Signalling Games*:** definition of signalling game, translation of definition of PBE (for general games) to a definition of PBE for signalling games, finding PBE in signalling games, applications of signalling in economics and finance

***Lecture 14 Dynamic Games of Incomplete Information – Refinements of Perfect Bayesian Equilibrium*:** implausible beliefs off-the-equilibrium-path, forward induction, domination-based refinements on beliefs, intuitive criterion, other refinements, applications

Lecture 15 Dynamic Games of Incomplete Information – Competitive Screening: signalling vs. screening, definition of screening game, monopolistic vs. competitive screening, competitive screening in the job market, equilibrium in screening games, existence of equilibrium, competitive screening and welfare

Lecture 16 Dynamic Games of Incomplete Information – Monopolistic Screening: pre-contractual asymmetric information vs. post-contractual asymmetric information, a refresher on quasi-linearity, application: second degree price discrimination, monopolistic screening with two types, the revelation principle, deterministic contracts vs. stochastic contracts, from two types to many types (finite number case), ironing and bunching, continuum of types

7. Mixed Topics (Applications of Concepts; probably NOT covered in the course)

Lecture 17 Principal Agent: details to be added

Lecture 18 Value of Commitment and Value of Information in Dynamic Games: details to be added

Lecture 19 Reputation Building: details to be added