

# Syllabus

## Social Science Methodology: Game Theory

Instructor: Oliver Westerwinter  
Spring Semester 2016

### **Time & room**

Monday 12:15-14h in 23-203

### **Office**

Oliver Westerwinter

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*Office hours:* Thursday 11-13h and by appointment

This syllabus may be subject to adjustments.

### **Overview and goals**

Strategic interdependence is ubiquitous in socio-political life. Individuals exchange goods, firms compete for market access, and states bargain over territory, voting shares in international organizations, and other goods they care about. In these and numerous other situations, actors must anticipate others' behavior to reach optimal decisions and maximize their utility. Non-cooperative game theory is a framework and set of techniques for understanding and analyzing such strategic interaction. Conflict, cooperation, coordination, bargaining, auctions, and communication are topics that can be investigated within this framework.

This course provides students with a systematic introduction to the fundamentals of non-cooperative game theory and their application to social science problems. It develops the basic concepts and results of non-cooperative game theory. Topics covered include a review of basic concepts of logic, set theory, probability theory, and optimization, decision theory, simultaneous and sequential move games, complete and incomplete information games, and repeated games. Substantive applications will be drawn from inter-firm competition, legislative bargaining, agenda manipulation, electoral competition, and international conflict.

The emphasis of the course is on the theoretical aspects of strategic behavior and the application of game theoretic concepts and models to questions of interest for social scientists. The primary objective is to enable students to understand research that uses game theoretic models. In addition, the course provides students with the skills required to start analyzing strategic situations and build simple game theoretic models on their own. Students will also engage in their own analyses and start developing their own game theoretic models.

### **Prerequisites**

A willingness to work through possibly unfamiliar material. A basic understanding of calculus and probability theory are helpful, but not required.

At the beginning of the course, we will review basic concepts and techniques from logic,

set theory, probability theory, and calculus that are needed to understand and use the tools of non-cooperative game theory.

## Class requirements

Final grades will be based on:

- Term paper (60% of final grade)
- Four homework assignments (40% of final grade)
- Participation in lectures

There will be four homework assignments, each of which will contribute 10% to your final grade for this class. The homework assignments will consist of analytical problems. The solutions of the assignments have to be submitted either in handwritten or printed form at the beginning of each class at which they are due. The assignments will be available one week prior to the class at which they are due. No late homework submissions will be accepted. All submitted homework will be graded. Solutions will be available electronically in due course after the submission of the assignments.

The homework assignments are solo exams. Thus, you always need to write and submit your own solutions. Please always make sure that you write your name on every page of your submission. Please note that the homework assignments are designed to support and deepen your understanding of the material discussed in class. They will help you to self-assess your level of accomplishment and plan your term paper project.

The term paper will contribute 60% to your final grade. It has to be submitted either as hard copy or electronically (pdf) by June 23. Late submissions will not be accepted. The term paper is expected to present a short independent research project that uses non-cooperative game theory. The maximum length of the paper is 5,000 words (including footnotes, references, etc.). The term paper is a solo exam. You are therefore expected to work on and submit your term paper project individually.

## Course website

We use StudyNet as communication platform for the class. The course site at StudyNet can be accessed here: <https://loginpages.unisg.ch/studynet>.

The course website at StudyNet will provide readings, homework assignments, and supplementary materials.

## Textbooks

The required readings in combination with the slides will be the primary teaching materials. The main textbook for the course is:

McCarty, Nolan and Adam Meirowitz. 2007. *Political Game Theory: An Introduction*. Cambridge: Cambridge University Press.

Students who are interested in consulting additional textbooks can choose from a broad variety of game theory texts with different strengths and weaknesses including:

Fudenberg, Drew and Jean Tirole. 1991. *Game Theory*. Cambridge: MIT Press.

Morrow, James D. 1994. *Game Theory for Political Scientists*. Princeton: Princeton University Press.

Myerson, Roger B. 1991. *Game Theory. Analysis of Conflict*. Cambridge: Harvard University Press.

Osborne, Martin J. 2004. *An Introduction to Game Theory*. New York: Oxford University Press.

## Schedule

The weekly coverage might change as it depends on the progress of the class. The assigned required and optional readings are listed in the class schedule for each session. The required readings should be completed prior to the session for which they are listed and studied carefully. In addition, it is recommended to consult the optional readings. The optional readings may prove useful to students looking for additional coverage of some of the course topics as well as for developing the topic of your term paper project. This schedule is subject to adjustments.

### February 22 – Introduction & review: logic, sets, probability theory, optimization

#### *Required readings:*

Lake, David A. and Robert Powell (eds.). 1999. *Strategic Choice and International Relations*. Princeton: Princeton University Press. Ch. 1

Moore, Wil H. and David A. Siegel. 2013. *A Mathematical Course for Political and Social Science*. Princeton: Princeton University Press. Ch. 9

#### *Optional readings:*

Morton, Rebecca B. 1999. *Methods and Models. A Guide to the Empirical Analysis of Formal Models in Political Science*. New York: Cambridge University Press. Ch. 1-3

Moore, Wil H. and David A. Siegel. 2013. *A Mathematical Course for Political and Social Science*. Princeton: Princeton University Press. Ch. 1, 10, 11

### February 29 – Review: logic, sets, probability theory, optimization (continued)

#### *Required readings:*

Moore, Wil H. and David A. Siegel. 2013. *A Mathematical Course for Political and Social Science*. Princeton: Princeton University Press. Ch. 16

*Optional readings:*

Simon, Carl and Blume, Lawrence. 2010. *Mathematics for Economists*. New York: Norton. Ch. 17-19

Moore, Wil H. and David A. Siegel. 2013. *A Mathematical Course for Political and Social Science*. Princeton: Princeton University Press. Ch. 15 + 17

**March 07 – Review: logic, sets, probability theory, optimization (continued)  
(first problem set available)***Required readings:*

Moore, Wil H. and David A. Siegel. 2013. *A Mathematical Course for Political and Social Science*. Princeton: Princeton University Press. Ch. 16

*Optional readings:*

Simon, Carl and Blume, Lawrence. 2010. *Mathematics for Economists*. New York: Norton. Ch. 17-19

Moore, Wil H. and David A. Siegel. 2013. *A Mathematical Course for Political and Social Science*. Princeton: Princeton University Press. Ch. 15 + 17

**March 14 – Decision-theoretic foundations (first problem set due)***Required readings:*

McCarty, Nolan and Adam Meirowitz. 2007. *Political Game Theory: An Introduction*. Cambridge: Cambridge University Press. Ch. 2 + 3

*Optional readings:*

Morrow, James D. 1994. *Game Theory for Political Scientists*. Princeton: Princeton University Press. Ch. 2

Myerson, Roger B. 1991. *Game Theory. Analysis of Conflict*. Cambridge: Harvard University Press. Ch. 1

**March 21 – Normal form games I (second problem set available)***Required readings:*

McCarty, Nolan and Adam Meirowitz. 2007. *Political Game Theory: An Introduction*. Cambridge: Cambridge University Press. Ch. 5

*Optional readings:*

Fudenberg, Drew and Jean Tirole. 1991. *Game Theory*. Cambridge: MIT Press. Ch. 1

Osborne, Martin J. 2004. *An Introduction to Game Theory*. New York: Oxford University Press. Ch. 2-3

**April 18 – Normal form games II (second problem set due)***Required readings:*

McCarty, Nolan and Adam Meirowitz. 2007. *Political Game Theory: An Introduction*. Cambridge: Cambridge University Press. Ch. 5

*Optional readings:*

Osborne, Martin J. 2004. *An Introduction to Game Theory*. New York: Oxford University Press. Ch. 4

**April 25 – Extensive form games I (third problem set available)***Required readings:*

McCarty, Nolan and Adam Meirowitz. 2007. *Political Game Theory: An Introduction*. Cambridge: Cambridge University Press. Ch. 7

*Optional readings:*

Fudenberg, Drew and Jean Tirole. 1991. *Game Theory*. Cambridge: MIT Press. Ch. 3

Osborne, Martin J. 2004. *An Introduction to Game Theory*. New York: Oxford University Press. Ch. 5-6

**May 02 – Extensive form games II (third problem set due)***Required readings:*

McCarty, Nolan and Adam Meirowitz. 2007. *Political Game Theory: An Introduction*. Cambridge: Cambridge University Press. Ch. 7

*Optional readings:*

Osborne, Martin J. 2004. *An Introduction to Game Theory*. New York: Oxford University Press. Ch. 7

**May 09 – Bayesian games I (fourth problem set available)**

*Required readings:*

McCarty, Nolan and Adam Meirowitz. 2007. *Political Game Theory: An Introduction*. Cambridge: Cambridge University Press. Ch. 6 + 8

*Optional readings:*

Calvert, Randall L. 1986. *Models of Imperfect Information in Politics*. London: Harwood.

Fudenberg, Drew and Jean Tirole. 1991. *Game Theory*. Cambridge: MIT Press. Ch. 6

Osborne, Martin J. 2004. *An Introduction to Game Theory*. New York: Oxford University Press. Ch. 9

**May 23 – Bayesian games II (fourth problem set due)***Required readings:*

McCarty, Nolan and Adam Meirowitz. 2007. *Political Game Theory: An Introduction*. Cambridge: Cambridge University Press. Ch. 6 + 8

*Optional readings:*

Banks, Jeffrey S. 1991. *Signaling Games in Political Science*. London: Routledge. Ch. 1-2

Fudenberg, Drew and Jean Tirole. 1991. *Game Theory*. Cambridge: MIT Press. Ch. 8

Osborne, Martin J. 2004. *An Introduction to Game Theory*. New York: Oxford University Press. Ch. 10

Spence, Michael. 1973. "Job Market Signaling." *Quarterly Journal of Economics* 87: 355-374.

**Further Optional Readings**

The following texts may turn out helpful for students who want to deepen some of the materials covered in class and review the basics of calculus, probability theory, and research design.

*For research design:*

King, Gary, Robert O. Keohane and Sidney Verba. 1994 *Designing Social Inquiry: Scientific Inference in Qualitative Research*. Princeton: Princeton University Press.

*For probability theory:*

Bertsekas, Dimitri and Tsitsiklis, John. 2002. *Introduction to Probability*. Second edition.

Blitzstein, Joseph K. and Jessica Hwang. 2015. *Introduction to Probability*. New York: Taylor & Francis.

Ugarte, Maria Dolores, Ana F. Militino and Alan T. Arnholt. 2016. *Probability and Statistics with R*. Second edition. London: Taylor & Francis.

*For mathematics:*

Gill, Jeff. 2006. *Essential Mathematics for Political and Social Research*. New York: Cambridge University Press.

Moore, Wil H. and David A. Siegel. 2013. *A Mathematical Course for Political and Social Science*. Princeton: Princeton University Press.

Simon, Carl and Blume, Lawrence. 2010. *Mathematics for Economists*. New York: Norton.