

# Syllabus

## Quantitative Methods

Instructor: Oliver Westerwinter  
Teaching assistant: Anastasija Tetereva  
Spring semester 2018

### Time & room

*Class:* Wednesday 12:15-2, 21.2, 28.2,  
7.3, 21.3, 28.3, 18.4, 9.5, 3.5 in 01-U121,  
2.5 in 14-024

*Exercise Group 1:* Wednesday March 14,  
April 25, May 16 10:15-12 in 36-108

*Exercise Group 2:* Wednesday March 15,  
April 25, May 16 12:15-2 in 01-U102

### Office

Oliver Westerwinter

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Anastasija Tetereva

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*Office hours:* Tuesday 8:30-10,  
starting Tuesday 27

This syllabus may be subject to adjustments.

## Overview and goals

This course provides a systematic introduction in the techniques and instruments of basic quantitative methods in the social sciences. The course is divided into three main parts. The first part deals with questions related to quantitative research design, sampling, measurement, and descriptive statistics. Part two covers basic topics of univariate statistics, such as point estimation, interval estimation, and hypothesis testing. The final part is concerned with regression models. The primary goal of the course is to provide students of the social sciences with the skills needed to understand and critically discuss social science research that uses statistical methods.

At the end of the course, you will have acquired solid training in the basics of descriptive and inferential statistical research methods. This includes knowledge of the elementary mathematical and probability theory related foundations of statistical methods. Furthermore, you will also be familiar with basic techniques of preparing, managing, visualizing, and analyzing statistical data using the computer software R.

## Prerequisites

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

## Class requirements

Final grades will be based on:

- Final exam (70% of final grade)

- Homework assignments (30% of final grade)
- Participation in lectures and exercises

There will be three homework assignments each of which will contribute 10% to your final grade. The homework assignments will consist of analytical problems and data analysis. They have to be submitted at the beginning of the exercise sessions. The homework assignments will be available at least one week prior to the next exercise session. No late homework submissions will be accepted. All submitted homework will be graded. Solutions will be discussed by the teaching assistant in the exercise sessions on the day the assignments are due. Solutions will also be available on the StudyNet website of the class.

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. You can submit handwritten solutions, computer printouts, as well as electronic solutions (as pdf file per email to: [oliver.westerwinter@unisg.ch](mailto:oliver.westerwinter@unisg.ch)). Independent of how you submit your solutions, make sure that you submit them prior to or at the beginning of the first exercise session for which they are due. 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 preparations for the final exam.

The final exam will be a 60 minutes, central in-class exam and held in English. The exam will be closed book but you will be allowed to use a calculator of the Texas Instruments TI-30 series. No other calculators will be allowed for the exam. You are also allowed to use a bilingual dictionary without notes.

Exchange students have the opportunity to take a 20 minutes oral exam on either May 24 or May 28 instead of the central written exam. If you are interested in taking the oral exam, please contact the instructor.

## Exercise sessions

Two exercise groups will complement the lectures. Each group will meet three times during the course of the semester. Group 1 will meet on Wednesday March 14, April 25, and May 16 at 10:15-12 in room 36-108. Group 2 will meet on Wednesday March 14, April 25, and May 16 at 12:15-2 in room 01-U102.

The exercise sessions will consist of a review of the theoretical material presented in the lectures, a discussion of the homework assignments, as well as computer exercises with R. All exercise sessions will be held in computer labs and will be run by the teaching assistant.

The exercise sessions are an integral part of this class. The solutions to the homework assignments will only be discussed in the exercise sessions.

## 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, datasets, sample R code, and supplementary materials.

## Computation

The course will be taught in R. R is an open-source computing language that is widely used in statistics. You can download it for free from [www.r-project.org](http://www.r-project.org) and it is recommended that you install R on your private computer prior to the start of class. For those of you who are not yet familiar with R, the exercise sessions provide an opportunity to learn the basics. Furthermore, we will provide detailed example code as well as other resources including an introductory manual on the StudyNet website of the course. Additional tutorials and other resources to learn about the basics of R are available at <http://wiki.math.yorku.ca/index.php/R:Gettingstarted>.

The books *Introductory Statistics with R* and *Political Analysis Using R* (for full references, see below) provide an accessible introduction to R.

## Reading

The assigned required readings are listed on the syllabus for each topic. You should read this material closely! In addition, it is recommended to consult the optional readings.

The required as well as the optional books will be provided in the university library in a special section for this class. I recommend to buy the Agresti book. Complementary reading materials will be provided at the course website at StudyNet.

### Required books

The following required textbook is available at the university library and will be used in the course.

Agresti, Alan. 2018. *Statistical Methods for the Social Sciences*. Fifth edition. Boston: Person.

### Optional books

The following books are optional but may prove useful to students looking for additional coverage of some of the course topics.

#### *Textbooks:*

Diez, David M., Christopher D. Barr and Mine Cetinkaya-Rundel. 2014. *OpenIntro Statistics*. Second edition. The book and the complementary materials are available at <https://www.openintro.org/stat/textbook.php>.

Greene, William H. 2012. *Econometric Analysis. International Edition*. Seventh edition. New York: Pearson.

Imai, Kosuke. 2017. *Quantitative Social Science. An Introduction*. Princeton: Princeton University Press.

Monogan III, James E. 2015. *Political Analysis Using R*. New York: Springer.

Wooldridge, Jeffrey. 2013. *Introductory Econometrics. A Modern Approach*. Fifth edition. New York: South-Western.

*Research design:*

Creswell, John W. 2014 *Research Design. Qualitative, Quantitative, and Mixed Methods Approaches*. Fourth Edition. Los Angeles: Sage.

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

*Introduction to R:*

Dalgaard, Peter. 2008. *Introductory Statistics with R*. Second edition. New York: Springer.

Field, Andy, Jeremy Miles and Zoë Field. 2012. *Discovering Statistics Using R*. Los Angeles: Sage.

*Probability:*

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

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

*Math background:*

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.

## **Preliminary schedule**

The weekly coverage might change as it depends on the progress of the class. The readings should be completed prior to the lecture for which they are listed. This schedule is subject to change.

In what follows, we refer to the Agresti book as A with chapter and section numbers following (e.g. A3.2-3.5 means chapter 3, sections 2-5 of Agresti). The book by James Monogan III will be referred to using M with the chapter and section numbers following (e.g. M4 refers to the fourth chapter of the James Monogan III book).

Additional required literature for each session will be listed with the name of the author followed by the chapter number. The details are available under “optional books”.

<b>Date</b>	<b>Topic</b>	<b>Readings/assignments</b>
21 Feb.	Basic concepts, sampling & measurement	A1 & 2
28 Feb.	Descriptive statistics	A3, M4
7 March	Probability distributions	A4.1-4.3, Wooldridge appendix B.1, B.3 & B.5 (normal distribution)
14 March	Exercise groups 1 & 2, session 1	Assignment 1
21 March	Univariate statistical inference I: Sampling distributions, point estimation & interval estimation	A4.4-4.6 & 5.1-5.3, Wooldridge appendix C.1-3 & C.5
28 March	Univariate statistical inference II: Hypothesis testing	A6.1-6.6, M5.1
18 April	Group comparisons & contingency tables	A7.1-7.4 & 8.1-8.4, M5.1.1-5.2
25 April	Exercise groups 1 & 2, session 2	Assignment 2
2 May	Regression & correlation I	A9.1-9.3, M5.3 & M6.1
9 May	Regression & correlation II	A9.4-9.6
16 May	Exercise groups 1 & 2, session 3	Assignment 3
23 May	Multiple regression & questions final exam	A10 & 11.1-11.3