

Course title: Quantitative methods 1.

Instructors: Michal Kotnarowski, Ph.D. (lectures and lab sessions) & Jacek Mazurczak, M.A. (lab sessions).

Academic year: 2021/2022

Planned course timetable:

Tuesdays 3-5 PM (hours are subject to change),

Thursdays 3-5 PM (hours are subject to change).

Teaching period: 19 October 2021 - 20 January 2022.

Format of the course: on-site teaching

General course description.

The course will cover basic and intermediate statistical techniques. The scope of the course encompasses both the basics of descriptive statistics and statistical inference (the use of samples to infer about the population). It also covers univariate, bivariate and multivariate statistical techniques. Upon completion of the course, participants will be familiar with a wide range of statistical methods that enable them to analyse various types of data, including survey data, administrative data, and experimental data. The logic of the course assumes that participants acquire a broad and grounded foundation of statistical knowledge. The proper foundations of statistical knowledge allow the course participants to learn more advanced statistical techniques in the future.

Goals of the course.

The most general aim of the course is to introduce the logic of quantitative research. Participants will learn what kind of research questions can be answered using quantitative approach. The course will also address the limitations of the quantitative methodology. In particular, the assumptions of statistical techniques and the consequences of not meeting these assumptions will be discussed at length.

The course will also have practical objectives. Upon completion of the course, participants will be able to understand academic papers using basic quantitative methodology. Besides, students will be able to carry out statistical analyses on their own using the techniques taught in the course.

In the study programme, participants also learn how to work with the R statistics software. It is currently the most popular and one of the most advanced statistical environments. With the R software, students will be able to carry out statistical analyses on their own and gain skills valuable in the labour market in academia and outside.

Course format.

The course will take the form of lectures and lab sessions. During the lectures, statistical topics will be introduced. We will discuss their properties and methods of application. During lab sessions, participants will learn how to perform statistical analyses in the R environment. Participants are asked to bring their laptops with R software installed for each lab session. Course instructors will provide information on how to install R software.

Involvement of participants:

The fundamental assumption of the course is the activity of students during the classes and their intensive work after meetings. Before each class, participants are required to read the given readings, on average, about 30 pages per week, often quite complex. After each class, it is expected that participants do their homework. Assignments usually will have a form of performing statistical analyses using R software.

Grading system.

The final grade consists of the following components:

Assignments. The assessment will be based on the delivery of assignment on time and the participant's dedication: 50% of the grade.

Final work. Preparation of a scientific report using statistical techniques discussed during the classes. The quality of prepared analyses will be assessed: 50% of the grade.

Schedule.

Provisional schedule of meetings during the first semester of the 2021/2022 academic year.

Meeting number	Lecture	Lab session
1.	Introduction to Quantitative methods. 19 October.	
2.		Introduction to R 1. 21 October
3.		Introduction to R 2. 26 October
4.		Introduction to R 3. 28 October
5 & 6	Central tendency parameters. 2 November	Lab session. 4 November
7 & 8	Measures of dispersion. 9 November	Lab session 10 or 12 November
9 & 10	Statistical graphics. 16 November	Lab session 18 November
11 & 12	The normal distribution 23 November	Lab session 25 November
13 & 14	Sampling distribution, confidence intervals 30 November	Lab session 2 December
15 & 16	Hypothesis testing 7 December	Lab session 9 December
17 & 18	Anova 14 December	Lab session 16 December
19 & 20	Bivariate measures of associations 1 4 January	Lab session 6 January
21 & 22	Bivariate measures of associations 2 11 January	Lab session 13 January
23 & 24	Consultations 18 January	Consultations 20 January

Readings.

Meeting 1. Introduction to Quantitative methods.

Healey 2011: Ch 1, 2; Spiegelhalter Ch. 1 and 2.

Meeting 2. Introduction to R.

Irizarry 2019: Ch. 1; Davies 2016: Ch. 2

Meetings 3, 4. Introduction to R.

Davies 2016: 3, 4, 5, 6.

Meetings 5, 6. Central tendency parameters.

Healey 2011: Ch. 3

Meetings 7, 8. Measures of dispersion

Healey 2011: Ch. 4; Kellstedt Whitten 2018: Ch. 6; Davies 2016: Ch. 13.

Meetings 9, 10. Statistical graphics.

Fox 2016: Ch. 3; Fox Weisberg 2019: Ch. 3.

Meetings 11, 12. The normal distribution.

Healey 2011: Ch. 5.

Meetings 13, 14. Sampling distribution, confidence intervals.

Healey 2011: Ch. 6 & 7; Kellstedt Whitten 2018: Ch. 7.

Meetings 15, 16. Hypothesis testing.

Healey 2011: Ch. 8, 9; Kellstedt Whitten 2018: Ch. 8.

Meetings 17, 18. Anova

Healey 2011: Ch. 10, 11; Field 2012: Ch. 10.

Meetings 19, 20. Bivariate measures of association 1

Healey 2011: Ch. 12, 13; Field 2012: Ch. 18.

Meetings 21, 22. Bivariate measures of association 2

Healey 2011: Ch. 14; Field 2012: Ch. 6; Kellstedt Whitten 2018: Ch. 9.

References (all readings will be made available to course participants):

Davies, Tilman M. *The book of R: a first course in programming and statistics*. San Francisco: No Starch Press, 2016.

Field, Andy P., Jeremy Miles, i Zoë Field. *Discovering statistics using R*. London ; Thousand Oaks, Calif: Sage, 2012.

Fox, John. 2016. *Applied Regression Analysis and Generalized Linear Models*. Third Edition. Los Angeles: SAGE.

Fox, John, i Sanford Weisberg. *An R companion to applied regression*. Third edition. Los Angeles: SAGE, 2019.

Healey, Joseph F. *Statistics: a tool for social research*. 9th ed. Belmont, CA: Cengage Learning/Wadsworth, 2011.

Irizarry, Rafael A. *Introduction to data science: data analysis and prediction algorithms with R*. Boca Raton: CRC Press, 2019.

Kellstedt, Paul M., i Guy D. Whitten. *The Fundamentals of Political Science Research*. 3. wyd. Cambridge University Press, 2018. <https://doi.org/10.1017/9781108131704>.

Spiegelhalter, David J. 2020. *The Art of Statistics: Learning from Data*. Published in paperback. UK USA Canada Ireland Australia India New Zealand South Africa: Pelican, an imprint of Penguin Books.