

Course Specifications

From the academic year 2016-2017 up to and including the

Statistics II: Project (C003559)

Course size (nominal values; actual values may depend on programme)
Credits 6.0 Study time 165 h Contact hrs 45.0 h

Course offerings and teaching methods in academic year 2018-2019

Offering	Language	Teaching Method	Hours
A (semester 2)	Dutch	seminar: coached exercises	3.75 h
		seminar: practical PC room classes	15.0 h
		group work	7.5 h
		microteaching	11.25 h
		lecture	7.5 h

Lecturers in academic year 2018-2019

Name	Code	Role
Heuchenne, Cédric	WE02	lecturer-in-charge
Vansteelandt, Stijn	WE02	co-lecturer

Offered in the following programmes in 2018-2019

Programme	crdts	offering
Bachelor of Science in Mathematics	6	A

Teaching languages

Dutch

Keywords

Probability, mathematical statistics

Position of the course

Move from theoretical, axiomatically built knowledge to relevant, concrete and efficient application and reporting. Learn to participate as a mathematician in a multi-disciplinary context as it presents itself in society and in many research settings. Learn to communicate assumptions and conclusions of a statistical analysis in a correct and clear fashion for both the specialist and the less specialized partner. Become familiar with the professional field.

Contents

At the start of the course, two guest speakers, a mathematician and non-mathematician, will be invited to talk about the use and importance of mathematics or statistics in their job. Each will propose a project that will be developed and worked out during the course of the semester. One of these projects will be the exam project. It requires knowledge and competences that are not contained within the initial competences of this course. During a discussion with the students the knowledge necessary for the development of the project, will be identified. This will then be developed in the course of the semester (see below). The other project is less extensive in nature and relies almost exclusively on the knowledge that is contained within the initial competences of this course. This project will be worked out in the course of the semester (see below).

Following these guest lectures and discussion with students, the following themes will be addressed:

- Principles and techniques of descriptive data analysis. Principal component analysis. Cluster analysis. Introduction to the software package R.
- Simulation experiments for the assessment of the properties of estimators, testing and statistical analyses.
- Use of statistics in the media, industry and academic research, scientific integrity and data confidentiality.
- Oral and written scientific report (in LaTeX)
 - The logical structure of the text : global and detailed , substantive and formal.

- Rules for authorship and order of authors.
- Source (acknowledgments, copyright and plagiarism).
- Reference styles (BibTeX).
- Structure of a slide, story structure and timing.

During the following classes students form teams and present the theory that is necessary for the exam project. This takes the form of lectures by the students, following discussion and feedback with the teacher. The content of these classes depends on the project and could concern basic techniques for data analysis, such as one-way ANOVA, multiplicity correction, analysis of contingency tables, nonparametric tests, study design, bootstrap and jackknife. These classes are enriched with a brief report in which a data analysis using these techniques in the software package R is illustrated. During the PC-labs, these techniques will be exercised under supervision using the R software.

The other project will be sequentially developed by the different teams during the course of the semester. In preparation for the exam project, this project aims to introduce the students to the research process:

- whereby an applied problem in empirical research is translated into a mathematical / statistical problem
- whereby various solution strategies are proposed and their quality is compared through analytical work and simulation experiments
- whereby the strategy that was found to be optimal, is used to analyze the available data and thus to offer an answer to the research question
- whereby the results are reported orally and in writing to fellow students and to the guest speaker who put in the problem.

A weekly discussion will take place concerning the problem at hand, following which one team goes on to work out a solution. Next, the findings are reported orally discussed in the entire group of students, after which the next team tackles the next problem. Possible problems could be the analysis of a randomized pre-test post-test design or stratified study design, whereby students may compare and evaluate various possible statistical analyses. Gradually the students will be made aware that various analyses are often possible, but that their quality is often different. The importance of statistical design and study protocol is discussed in that light. In a third project, the students individually discuss the quality of the statistical information in a news magazine article of choice.

Initial competences

Final competences of the courses Statistics I and Analysis I.

Final competences

- 1 The student must recognize the relevance of simple statistical methods for practical problems and be able to work out the solution.
- 2 She/ he can report results, both orally and written, in a transparent and correct manner.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Group work, lecture, microteaching, seminar: coached exercises, seminar: practical PC room classes

Extra information on the teaching methods

Theory: lectures. Exercises, including computer practicals, under guidance in class; visits to the (digital) library; project work in team with reporting and feedback; exchanges through the electronic learning environment.

Learning materials and price

Slides are available on Minerva.
Further supported by elements from textbooks (online available).

References

W. Mendenhall. 'Mathematical Statistics with Applications' (6th edition); Duxbury Press, 2001.
D. Nolan and T. Speed. 'Stat Labs: Mathematical Statistics through applications'; Springer, 2000.

Course content-related study coaching

Lectures and computer practicals, independent work with reporting and feedback, exchanges through the electronic learning environment.

Evaluation methods

end-of-term evaluation and continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Open book examination

Examination methods in case of periodic evaluation during the second examination period

Open book examination

Examination methods in case of permanent evaluation

Assignment, report

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible in modified form

Extra information on the examination methods

The knowledge and problem solving skills of the students are tested by means of written and oral reporting of project work.

Calculation of the examination mark

Permanent evaluation (oral and written reporting):

- 1 group work (worked out in the course of the semester under supervision) with written and oral reports (25%)
- 1 group work (development of a lecture and worked out under supervision) with written and oral reports (20%)
- 1 individual project on reporting of statistical information (5%)
- 1 group work (proposed by guest speaker and individually worked as exam project) with written report and individual oral defense (30%)

Periodic evaluation: open book exam (30%)