

Statistics (C000337)

Due to Covid 19, the education and assessment methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

Course size	<i>(nominal values; actual values may depend on programme)</i>		
Credits 4.0	Study time 120 h	Contact hrs	39.0h

Course offerings and teaching methods in academic year 2021-2022

A (semester 1)	Dutch	Gent	seminar: practical PC room classes	23.75h
			lecture	15.0h
			online lecture	0.0h

Lecturers in academic year 2021-2022

Clement, Lieven	WE02	lecturer-in-charge
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Offered in the following programmes in 2021-2022

	crdts	offering
Bachelor of Science in Biology	4	A
Bachelor of Science in Chemistry	4	A

Teaching languages

Dutch

Keywords

Statistics, statistical data analysis, linear models, hypothesis testing, analysis of variance, regression analysis, logistic regression, non-parametric tests.

Position of the course

The general introduction introduces the role of statistics in the Scientific Method, and statistical inference (parameter estimation, confidence intervals, hypothesis testing). The course focuses on linear regression and analysis of variance. Together these methods form the class of General Linear Models. The course also introduces the basics of non-parametric testing, categorical data analysis and briefly touches upon logistic regression.

Throughout the course the role of statistical science in the Scientific Method is stressed. New concepts are introduced via case-studies. For every study the research question and the study design are introduced, which is followed by a data exploration. Next, statistical models are built and the link between model parameters and the research question is emphasized. The case study concludes with a conclusion formulated in terms of the research question. The course focusses heavily on the link between theory and practice and on correct scientific reporting of the results.

In the context of reproducible research the digital e-course is developed in R/R markdown. The students can use it as a reference to develop their own R/Rmarkdown scripts and notebooks.

This approach enables the students to weave statistical analyses and interpretation in webpages and pdf-documents so that their entire data analysis workflow is transparent and reproducible.

Contents

- The Scientific Method
- Introduction to theoretical distributions: the Binomial, Poisson and normal distribution.
- Data exploration of univariate and bivariate observations.
- Statistical inference (parameter estimation, confidence intervals and hypothesis testing).
- The general linear model (single linear regression and analysis of variance)
- Multiple comparison of means
- Non-parametric tests.
- Contingency tables
- Logistic regression

Initial competences

Final objectives of Mathematics I.

Final competences

- 1 The student has a good understanding of the basic concepts of statistical inference.
- 2 The student is able to translate a research question, with a given experimental design, to a statistical analysis method.
- 3 The student can value and interpret the results of statistical analyses.
- 4 The student can correctly and scientifically report the results of statistical analyses.
- 5 The student can perform statistical analyses in the R software package. He/she can interpret and report analyses and analysis results in R-notebooks so that all the results are transparent and reproducible.

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

Online lecture, Online seminar: practical pc room classes, Lecture, Seminar: practical pc room classes

Extra information on the teaching methods

The focus in the PC tutorials is on the translation of the research question to appropriate statistical models, data exploration, data analysis, interpretation and reporting on all data analysis steps by the use of R-software and R-notebooks.

Learning materials and price

A digital e-course is available on the webpage of the lecturer. The pdf version of the course notes and all lecture material are distributed via the digital learning environment of the university. In the exercises we will also make use of github. All material is freely available.

References

- Kutner, M.H., Nachtsheim, C.J., Neter, J. and Li, W. (2005) Applied Linear Statistical Models, 5th Edition, McGraw-Hill.
- Montgomery, D. (1997) Design and analysis of experiments, Wiley.
- Moore, D. and McCabe, G. (2005). Introduction to the Practice of Statistics . W.H. Freeman and Company.

Course content-related study coaching

Students are closely monitored and coached during computer practicals and project work. In addition there is opportunity for exchange with lecturers outside class via the electronic learning environment.

Assessment moments

end-of-term and continuous assessment

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

Written examination with multiple choice questions, Open book examination

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

Written examination with multiple choice questions, Open book examination

Examination methods in case of permanent assessment

Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible in modified form

Extra information on the examination methods

Non-periodical evaluation: project work

Periodical evaluation: Theory and exercises, written, exam with multiple choice questions, open book. An exam on an alternative date can only be provided if stated in the exam regulations and is only possible in modified form.

Calculation of the examination mark

A second examination chance is possible for the non-periodical evaluation. If one does not participate in the non-periodical evaluation, the final mark will be at most 7/20, regardless the mark obtained for the periodical evaluation.

Score: Periodical evaluation 15 (75%) + non-periodical evaluation 5 (25%).