GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Statistical Data Processing (I002441)

Course size *(nominal values; actual values may depend on programme)*

Credits 4.0 **Study time 120 h**

Course offerings and teaching methods in academic year 2024-2025

A (semester 1)	Dutch	Gent	lecture
			seminar

Lecturers in academic year 2024-2025

Meys, Joris	LA26	staff member
Luca, Stijn	LA26	lecturer-in-charge

Offered in the following programmes in 2024-2025	crdts	offering
Bachelor of Science in Bioscience Engineering	4	A
Preparatory Course Master of Science in Bioinformatics(main subject Bioscience Engineering)	4	A

Teaching languages

Dutch

Keywords

statistics, data analysis, linear models, hypothesis testing, analysis of variance, regression analysis, logistic regression, non-parametric tests

Position of the course

This introductory course aims to impart insights and knowledge of the main statistical methods that can be used to perform a data analysis. For this purpose, the application of the methods as well as the mathematical concepts and properties underpinning the theory will be treated. In addition, students learn how to apply the methods using a statistical software package.

Contents

(1) Introductory concepts: descriptive statistics, random variables and their distribution, properties of lineair combinations of random variables.
(2) Inference from normally distributed data: t-tests, F-test to compare variances, P-values, type I and type II errors
(3) The general linear model: t-test on a regression coefficient, analysis of variance, extra sum of squares, (adjusted) R-squared and model selection, quantitative and qualitative explanatory variables, interactions, post-hoc analysis, geometric interpretation of regression, hat-matrix.
(4) The generalized lineair model: likelihood principles, Fisher information, deviance, logistic and Poisson regression, problem of overdispersion.
(5) Non-parametric statistics.

Initial competences

Statistical Data Processing builds on certain learning outcomes of course units 'Calculus', 'Linear algebra', 'Probabilistic models', and 'Data science', or the learning outcomes have been achieved differently

Final competences

1 Understanding and having insight in the abstract notations and properties from mathematical statistics.
2 Understanding and recognizing the concepts of statistical inference and the general(ized) lineair model in the context of a practical data analysis
3 The student is able to translate a research question, with a given experimental

design, to a statistical analysis method and/or a (general linear) hypothesis.
4 Performing a statistical data analysis with the software R.
5 Interpreting and having insight in the numerical results of a statistical data analysis.
6 Drawing and formulating correct conclusions based on the output of a statistical test.

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

Seminar, Lecture

Extra information on the teaching methods

Statistical principles which are addressed in the theoretical lectures are practiced and applied in excercices. Students learn to use appropriate statistical tests with the statistical software package R.
During the lecture the theory and methods are taught and initial excercises are made.

Study material

Type: Syllabus

Name: Statistical data analysis
Indicative price: € 15
Optional: no
Language : Dutch
Available on Ufora : Yes
Online Available : No
Available in the Library : No
Available through Student Association : Yes
Additional information: Cursus is mainly in dutch - one chapter is in english.

References

Fox, J. (2016). Applied Regression Analysis and Generalized Lineair Models. SAGE publications Inc.
Moore, D. and McCabe, G. (2005). Introduction to the Practice of Statistics. W.H. Freeman and Company.

Course content-related study coaching

During the practical courses students are guided for solving excercises
Also, support can be provided through forums of UFORA.

Assessment moments

end-of-term and continuous assessment

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

Written assessment open-book

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

Written assessment open-book

Examination methods in case of permanent assessment

Skills test

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

The period aligned evaluation consists in a written open book examination with the use of R. As well insight in the theory as the application of the methods in a practical data analysis setting will be evaluated.
The non-period aligned evaluation in the first exam period consist of a small take-home task.
In the second exam period, there is only a written open book examination with the use of R.

Calculation of the examination mark

In the first evaluation period, a mark is given at a total of 20 points. 2/20 can be earned with the take-home work. 18/20 can be earned with the written exam. In the second evaluation period, all points are given on the written exam (so the score of the take-home work is not transferred to the second evaluation period).