

Analysis of Clustered and Longitudinal Data (C003398)

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

Credits 5.0

Study time 150 h

Course offerings and teaching methods in academic year 2024-2025

A (semester 2)

English

Gent

lecture

seminar

group work

Lecturers in academic year 2024-2025

Vansteelandt, Stijn

WE02

lecturer-in-charge

Mertens, Karl

WE02

co-lecturer

Offered in the following programmes in 2024-2025

[Master of Science in Bioinformatics\(main subject Systems Biology\)](#)

crdts

5

offering

A

[Master of Science in Statistical Data Analysis](#)

5

A

Teaching languages

English

Keywords

Growth curves, longitudinal data analysis, marginal analysis, random effects methods, multilevel analysis

Position of the course

To provide the student with statistical methods for the analysis of clustered continuous and categorical data, with an emphasis on repeated measures over time. To understand clearly the difference between a marginal analysis and a conditional random effects analysis. Learn how to model correlation structures. Make predictions with justified error margins based on well understood assumptions. Create an awareness of the potential selectivity associated with measurement timing and attrition in the data set.

Contents

- Summary statistics for repeated measures over time
 - Covariance structures
 - Marginal analysis and generalized estimating equations
 - Conditional analysis and random-effects methods
 - ML and REML methods
 - Growth curves
 - Multilevel data
 - Model-fitting versus prediction
 - Balancing pros and cons of marginal versus conditional methods
 - Fixed versus random measurement-times
 - Design and sample size, more individuals versus more measures per individual
 - The impact of attrition (missing data) on the analysis
- Applications in ecology, economy, epidemiology, medicine, agriculture, sociology...

Initial competences

Analysis of Continuous Data

Final competences

- 1 Have knowledge of the basic theories and concepts of methods for the analysis of clustered and longitudinal data.

- 2 The students can present and fit appropriate models for correlated data and repeated measures over time.
- 3 They will recognize the problem of bias when measurement points are selectively chosen.
- 4 They can design studies to obtain relevant information in an unbiased and efficient way.
- 5 They can analyse data sets with repeated continuous and categorical data with appropriate software.
- 6 They can draw justified conclusions and report them in a correct and transparent fashion.
- 7 They can critically read clustered data analysis and longitudinal analysis reports in the scientific literature.

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, Seminar, Lecture

Study material

Type: Handbook

Name: Applied longitudinal analysis
 Indicative price: € 130
 Optional: yes
 Language : English
 Author : Fitzmaurice, Laird, Ware
 Online Available : Yes
 Available in the Library : Yes

Type: Slides

Name: Analysis of clustered and longitudinal data
 Indicative price: € 10
 Optional: no
 Language : English
 Available on Ufora : Yes
 Online Available : Yes
 Available in the Library : No
 Available through Student Association : No

References

Heagerty, P., Liang, K.-Y., Zeger, S.L. and Diggle, P. (2002). Analysis of Longitudinal Data. Oxford University Press.
 Fitzmaurice, G., Laird, N. and Ware, J. (2004). Applied Longitudinal Analysis. Wiley.
 Verbeke, G. and Molenberghs, G. (2000). Linear Mixed Models for Longitudinal Data. Springer-Verlag.

Course content-related study coaching

Students are coached by assistants during PC-practicals. Through the electronic learning environment they can exchange questions and answers outside lecture hours. A series of projects will provide the students with practical experience in data analysis.

Assessment moments

end-of-term and continuous assessment

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

Oral assessment, Written assessment with open-ended questions, Assignment

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

Oral assessment, Written assessment with open-ended questions, Assignment

Examination methods in case of permanent assessment

Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible

Extra information on the examination methods

The knowledge and problem solving skills of the students are tested by means of a written exam and data analytic projects.

Calculation of the examination mark

Theory: periodic

Exercises: periodic and permanent (project work)

Two projects will be assigned. The final project must be orally defended.

Calculation of the total score: exam 60%, first project 10%, second project and oral defense 30%.

A second examination chance for the project is possible. Non-participation to at least one of the project works implies a maximum score (exam + project) of at most 7/20, regardless of the score obtained on the final exam.