GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2026-2027

Applied Statistics (I002756)

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 2027-2028

A (semester 1)	English	Gent	lecture
			seminar

Lecturers in academic year 2027-2028

Coussement, Louis	LA26	lecturer-in-charge
Meys, Joris	LA26	staff member

Offered in the following programmes in 2027-2028	crdts	offering
International Master of Science in Soils and Global Change (main subject Soil Ecosystem Services and Global Change)	5	A
International Master of Science in Soils and Global Change (main subject Soil-Plant System Processes and Global Change)	5	A
Master of Science in Bioinformatics(main subject Systems Biology)	5	A
International Master of Science in Health Management in Aquaculture	5	A
Master of Science in Aquaculture	5	A
Master of Science in Food Technology	5	A
Master of Science in Nutrition and Food Systems	5	A
Exchange Programme in Bioscience Engineering: Agricultural Sciences (master's level)	5	A
Exchange Programme in Bioscience Engineering: Ecosystem Management (master's level)	5	A
Exchange Programme in Bioscience Engineering: Food Science and Nutrition (master's level)	5	A

Teaching languages

English

Keywords

Statistics, Applied, Statistical inference, Data analysis, Regression analysis

Position of the course

This course is tailored for researchers who aim to analyze (biological) data and derive statistically sound conclusions to address their research inquiries. The primary focus is on the accurate application of prevalent statistical methodologies, coupled with the critical interpretation and effective reporting of findings. A comprehensive understanding of the mathematical underpinnings behind these techniques is essential for students to navigate through the course material effectively. The emphasis of this course is placed on the application of statistical methods, hence an important part of the study time is attributed to performing analysis on an independent base using the statistical software program R.

Contents

The content of this course includes basic and prevalent statistical methods used for data analysis and is divided into several parts:

- Basics of statistical inference: populations, sampling, distributions, estimating parameters and confidence intervals.
- Hypotheses and statistical tests for a set of estimates including proportions, means, and frequencies: e.g. Student's T-test, Chi-square test etc.
- The framework of the (linear) regression analysis: relations between variables, testing model parameters, variance analysis, model selection.

- Modelling using linear regression models: additive models, interaction models, ANOVA models, post hoc testing.

Initial competences

We expect students to have:
- A basic knowledge of calculus (mathematical notation, function analysis, limits, derivatives, integrals) and probability theory (random variables, basic probability calculations, common distributions).
- A knowledge of basic data science (variable types, common measures of center and spread of a sample distribution).
- Digital literacy: knowledge of computer basics (folder structures, file types, installing and executing software) coupled with a basic proficiency in performing tasks on any operating system.
- A basic knowledge of scientific computing using any language/software package. Knowledge of R specifically is useful but certainly not required.

Final competences

1 Understanding the basic concepts of statistical inference.
2 Performing a complete statistical analysis in R, starting from a dataset and a research question.
3 Recognizing important problems/limitations in study design and analysis methods.
4 Understanding how limitations of the study may affect conclusions based on their results.
5 Interpreting results of a statistical data analysis correctly.
6 Reporting the results of a statistical data analysis concisely and clearly.
7 Translating the results of a statistical data analysis into layman terms.

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, Practical, Independent work

Extra information on the teaching methods

Theoretical concepts are explained and taught in classical ex-cathedra lectures.
In the practical sessions, students can work through exercises guided by our teaching staff.
Progress can be self-evaluated by the students using (mandatory) online self-tests.
Direct feedback after each test allows for learning throughout the evaluation process.

Study material

None

References

J. Neter, M. Kutner, C. Nachstheim, W. Wasserman. 'Applied Linear Statistical Models', 5th edition. McGraw-Hill Education, 2005

Course content-related study coaching

During the exercise sessions the students are coached by assistants. Through the electronic learning environment (Ufora) students can exchange questions and answers outside lecture hours among themselves and with lecturers. After using the online channels, persisting individual questions may be answered during a meeting with the lecturer after making an appointment.

Assessment moments

end-of-term and continuous assessment

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

Skills test, Written assessment with open-ended questions

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

Written assessment with open-ended questions

Examination methods in case of permanent assessment

Skills test, Written assessment with open-ended questions

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

Examination methods in case of non-periodic assessment:
The default examination method is non-periodic/continuous assessment (see 'Extra information NPE' below), in the form of online tests with multiple choice and open ended questions; written assignments with open ended questions.

Examination methods in case of periodic assessment
If students do not pass the first examination (NPE during the semester), then they will take the second chance examination, in the form of a written exam (see 'Evaluation for periodic evaluation (PE; second exam chance).

Extra information for non-periodic evaluation (NPE)
Students are evaluated throughout the semester upon completion of a substantial and comprehensive part of the course (divided into 5 parts). The first two tests are performed online, the three parts are performed in a PC lab – only the (digitally) written part is graded:

- NPE1: introduction and basic principles of statistics – online test;
- NPE2: Statistical inference and decision making – online test;
- NPE3: Hypothesis tests – (digitally) written test;
- NPE4: Construction of a linear model/prediction – (digitally) written test;
- NPE5: Generalized linear hypothesis testing – (digitally) written test.

All parts of non-periodic evaluation assess both theoretical concepts and application of data analytical and statistical methods (by use and interpretation of R statistical software). This assessment format is intended to keep students active in keeping up with the course material over the semester.
Remark: If students cannot participate in the NPE, e.g. due to international mobility or other exceptional circumstances (i.e. after failing two exam chances in the previous academic year), they will be offered two exam chances of the periodic evaluation format (one in the first exam period and one in the second exam period).

Evaluation for periodic evaluation (PE; second exam chance)
Students are evaluated through a (digitally) written exam assessing both theoretical concepts and application of data analytical and statistical methods (by use and interpretation of R statistical software).
Remark: For students that are abroad during the second semester due to international mobility, the second exam chance will be provided during the first exam period (i.e. early January). This exam chance will also be opened to students unable to follow the NPE due to international mobility (see evaluation for NPE).

Calculation of the examination mark

Non-periodic evaluation (NPE):
All parts of NPE are weighted by their importance and respective proportion of the course: NPE1 (1.5 pts) + NPE2 (1.5 pts) + NPE3 (3 pts) + NPE4 (6 pts) + NPE5 (8 pts) resulting in a final score on a total of 20 points.

Periodic evaluation (PE):
PE is scored entirely based on the (digitally) written exam, resulting in a final score on a total of 20 points.

Facilities for Working Students

Upon agreement by the teaching team, work students that are not able to participate in the NPE can be offered two exam chances of the periodic evaluation format (see Details of evaluation section).