GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2025-2026

Statistics and Data Processing (C001195)

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

Credits 6.0 **Study time 180 h**

Course offerings and teaching methods in academic year 2025-2026

A (semester 1)	Dutch	Gent	lecture
			seminar

Lecturers in academic year 2025-2026

van der Wel, Arjen	WE05	lecturer-in-charge

Offered in the following programmes in 2025-2026	**crdts**	**offering**
Bachelor of Science in Physics and Astronomy	6	A

Teaching languages

Dutch

Keywords

Statistics, data treatment

Position of the course

This course unit belongs to the learning pathway "Experimental physics and astronomy; data processing" in the Bachelor program Physics and Astronomy. An introduction in statistics is given. In particular the techniques that are often used in physics and astronomy are introduced and trained. The student learns how to apply statistical methods in writing reports or in the interpretation of experimental results. This is an essential prerequisite for projects or laboratory courses.

Contents

- Distributions: mean value, spreads, correlations.
- Theoretical distributions: binomial distribution, Poisson distribution, Gauss distribution, multidimensional Gauss.
- Errors: central limit theorem, combining errors, systematic errors.
- Estimating: properties, minimum variance bound, maximum likelihood, extended maximum likelihood, moments, stratified sampling.
- Least squares: method, fitting a straight line, binned data, chi^2-distribution.
- Probability and confidence: Bayes' theorem, confidencelevels, confidenceregions.
- Taking decisions: testing hypotheses, nul-hypothesis, goodness-of-fit, comparing two samples, Student-t distribution.
- Monte Carlo: pseudo-random generators, numerical integrals, generating distributions, simulations, algorithms.
- Queuing theory: ticket sales, queue with random structure.
- Markov chains: random walk, gambler's ruin.

Initial competences

No particular prerequisites necessary. A basic knowledge of combinatorics, analysis and algebra is assumed.

Final competences

1 Have the ability to write scientific reports with a good understanding of the reached accuracy.
2 Have a basic knowledge of computer intensive simulation techniques.
3 Be able to compare two experimental results or experiment and theory.

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

Study material

Type: Syllabus

Name: Syllabus
Indicative price: Free or paid by faculty
Optional: no
Additional information: available through Ufora

Type: Slides

Name: Lectures slides
Indicative price: Free or paid by faculty
Optional: no
Additional information: available through Ufora

References

B.Roe, “Probability and statistics in experimental physics” (Springer, 2001)
R.J.Barlow, “Statistics: a guide to the use of statistical methods in the physical sciences” (John Wiley & Sons, 1993)

Course content-related study coaching

After the lectures the lecturer is available for additional explanations. The lecturer is always reachable through e-mail.

Assessment moments

end-of-term assessment

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

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

Possibilities of retake in case of permanent assessment

not applicable

Extra information on the examination methods

Theory: written (closed book)
Exercises: written (open book)

Calculation of the examination mark

Theory: 40%
Exercises: 60%