

## Statistics and Data Processing (C001195)

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

Credits 6.0      Study time 180 h      Contact hrs 52.5 h

Course offerings and teaching methods in academic year 2018-2019

A (semester 1)	Dutch	seminar: practical PC room classes	7.5 h
		seminar: coached exercises	15.0 h
		lecture	30.0 h

Lecturers in academic year 2018-2019

De Looze, Ilse	WE05	lecturer-in-charge
Baes, Maarten	WE05	co-lecturer

Offered in the following programmes in 2018-2019

<a href="#">Bachelor of Science in Physics and Astronomy</a>	crdts	offering
	6	A

Teaching languages

Dutch

Keywords

Statistics, data treatment

Position of the course

An introduction in statistics is given. In particular the techniques that are often used in physics 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, confidence levels, confidence regions.
- 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 supposed.

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

Lecture, seminar: coached exercises, seminar: practical PC room classes

#### Learning materials and price

Syllabus is available. Can also be downloaded from website.

#### 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

Students have individual access to the lecturer after the lectures. The lecturer is always reachable through e-mail.

#### Evaluation methods

end-of-term evaluation

#### Examination methods in case of periodic evaluation during the first examination period

Written examination with open questions, open book examination

#### Examination methods in case of periodic evaluation during the second examination period

Written examination with open questions, open book examination

#### Examination methods in case of permanent evaluation

#### Possibilities of retake in case of permanent evaluation

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%