

Statistics and Data Processing (C001195)

Due to Covid 19, the education and evaluation methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

Course size	<i>(nominal values; actual values may depend on programme)</i>		
Credits 6.0	Study time 180 h	Contact hrs	52.5 h

Course offerings and teaching methods in academic year 2020-2021

A (semester 1)	Dutch	Gent	seminar: practical PC room classes	7.5 h
			lecture	30.0 h
			seminar: coached exercises	15.0 h
			online seminar: practical PC room classes	0.0 h
			online lecture	0.0 h
			online seminar: coached exercises	0.0 h

Lecturers in academic year 2020-2021

van der Wel, Arjen WE05 lecturer-in-charge

Offered in the following programmes in 2020-2021

Bachelor of Science in Physics and Astronomy	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 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, χ^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 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

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

Learning materials and price

The syllabus is available through Ufora. Exercises will be handed out at each exercise class and then made available via 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.

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%