Course Specifications

Valid as from the academic year 2023-2024

Statistics and Mathematical Data-analysis (E702090)

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 2023-2024

| A (semester 2) | Dutch | Gent | lecture |
| | | | seminar |

Lecturers in academic year 2023-2024

| Van Hecke, Tanja | TW05 | lecturer-in-charge |
| Tonesi, Cristina | TW05 | co-lecturer |

Offered in the following programmes in 2023-2024	crdts	offering
Bachelor of Science in Engineering Technology(main subject Chemical Engineering Technology)	6	A
Bachelor of Science in Engineering Technology(main subject Civil Engineering Technology)	6	A
Bachelor of Science in Engineering Technology(main subject Electromechanical Engineering Technology)	6	A
Bachelor of Science in Engineering Technology(main subject Electronics and ICT Engineering Technology)	6	A
Bachelor of Science in Engineering Technology(main subject Information Engineering Technology)	6	A
Linking Course Master of Science in Electrical Engineering Technology(main subject Automation)	6	A
Linking Course Master of Science in Electrical Engineering Technology(main subject Electrical Engineering)	6	A
Linking Course Master of Science in Electronics and ICT Engineering Technology(main subject Electronics Engineering)	6	A
Linking Course Master of Science in Electronics and ICT Engineering Technology(main subject Embedded Systems)	6	A
Linking Course Master of Science in Electronics and ICT Engineering Technology(main subject ICT)	6	A
Linking Course Master of Science in Electromechanical Engineering Technology	6	A
Linking Course Master of Science in Information Engineering Technology	6	A
Linking Course Master of Science in Land Survey Engineering Technology	6	A

Teaching languages

Dutch

Keywords

Probability, statistics, probability distributions, parameter estimation, hypothesis testing, representation of data, regression analysis, analysis of variance, correlation, mathematical analysis, linear algebra.

Position of the course

The aim of the course is to provide insight into the concepts and reasoning of elementary statistical methods which are necessary in many scientific fields for quality control and production processes.
The course aims to obtain a critical and correct attitude among the students when they will use mathematical and statistical software in their further career as a (future) engineer.

Contents

• Probability: definitions, combinatorics, properties, Bayes' theorem.
• Descriptive statistics, population and sample, discrete and continuous random variables,

parameters of a sample.
- Probability and distribution functions: definitions, properties, parameters of a population, Chebyshev's inequality, moment generating function.
- Discrete distributions: uniform discrete, Bernoulli, binomial, geometric, hypergeometric and Poisson distribution.
- Continuous distributions: uniform continuous, exponential, normal, Chi-squared, t- and F-distribution. Approximation theorems and the central limit theorem.
- Estimation theory: unbiased and efficient estimates, maximum likelihood estimates, confidence and prediction intervals.
- Hypothesis testing: general methodology, type I and II errors, testing of population parameters, Goodness-of-Fit test, anova
- Linear regression, correlation.
- Matlab in mathematics / statistics: 2D and 3D graphs, matrix calculus, solving (systems of) equations, optimisation problems, Laplace transform, series, graphical representation of data, descriptive statistics, hypothesis testing, confidence intervals, Goodness-of-Fit testing, analysis of variance (one-way and two-way anova), correlation, regression analysis.

Initial competences

Knowledge of mathematical topics as treated in the courses Mathematics 1, Mathematics 2 and Signals and Systems.

Final competences

1 Calculate probabilities of simple events.
2 Present empirical data in a correct and comprehensive way.
3 Understand the properties of several discrete and continuous probability functions.
4 Use tables of distributions functions.
5 Understand and apply methods for parameter estimation.
6 Formulate and test a hypothesis statistically.
7 Translate a mathematical problem from engineering sciences into commandos for mathematical / statistical software.
8 Select an adequate statistical analysis in order to make well-founded conclusions based on data where results are interpreted critically.

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

Learning materials and price

- Lecture notes in Dutch.
- Slides, manual Matlab and data-files available on the electronic learning platform, as well as additional e-learning material
- Price: about 7 euro
- (free use of software on Athena)

References

Introduction to Probability and Statistics, W. Mendenhall, Duxberry Press.
Introductory Statistics, Neil A. Weiss, Pearson
Introduction to MATLAB, D. Etter, Pearson

Course content-related study coaching

Tutorial service
The lecturer can be asked questions immediately after the lessons or by appointment or by means of Ufora.

Assessment moments

end-of-term and continuous assessment

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

Written assessment with multiple-choice questions, Written assessment with open-ended questions

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

Written assessment with multiple-choice questions, Written assessment with open-ended questions

Examination methods in case of permanent assessment

Skills test, Written assessment open-book

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible

Extra information on the examination methods

First and second exam session: written, closed-book examination (theoretical questions and exercises) where a formulary and an elementary calculator are admitted.

In between term evaluation: written, open-book evaluation with Matlab at the disposal of the students.

Calculation of the examination mark

Final score=1/3 * score IE + 2/3 * score E

IE= in between term Matlab evaluation (/20)

E=exam (/20)

Remark:

·   If 7 at most is reached for E or IE and the calculated final score is at least 10, a final score of 9/20 will be contributed.

·   In the second session the Matlab test can be retaken. For students who are not using this right, the IE score of the first session will be taken into account for the IE score in the second session.