GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Probabilistic Models (I002435)

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 2024-2025

A (semester 2)	Dutch	Gent	lecture
			seminar

Lecturers in academic year 2024-2025

Köse, Demir Ali	LA26	staff member
Van de Walle, Elien	LA26	staff member
De Baets, Bernard	LA26	lecturer-in-charge

Offered in the following programmes in 2024-2025	**crdts**	**offering**
Bachelor of Science in Bioscience Engineering	5	A

Teaching languages

Dutch

Keywords

Probability, random variables and random vectors, uncertainty propagation, stochastic processes, limit theorems, Markov chains, samples, parameter estimation

Position of the course

This course is a logically structured and modern introduction to probability theory, starting from the concept of a probabilistic model. It aims to familiarize the students with the techniques needed to handle uncertainty through the use of random variables. It forms the basis for the modelling of uncertainty in engineering courses. Starting from samples and the notion of a statistical model, the problem of parameter estimation is tackled. This forms the basis for courses in statistics.
The theoretical concepts are amply illustrated on examples, with emphasis on the problem solving abilities of the student and engineering skills. The material is introduced in an intuitive manner.

Contents

1. Classical probability theory
2. Random variables
3. Random vectors
4. Important distributions
5. Uncertainty propagation
6. Stochastic processes and limit theorems
7. Markov ketens
8. Parameter estimation

Initial competences

'Probabilistic Models' builds on certain learning outcomes of course units 'Analysis: functions of one variable', 'Analysis: functions of more variables', 'Linear algebra', and 'Scientific Computing'; or the learning outcomes have been achieved differently.

Final competences

1 Basic intuition and insight in discrete and continuous random variables and

random vectors, (in)dependence and conditioning.
2 Understand the practical implications of limit theorems.
3 Transform a problem description into a probabilistic model.
4 Solve problems on probabilistic models easily.
5 Given a problem description and data, suggest a distribution and estimate its parameters.
6 Being capable of using Jupyter notebooks to solve probabilistic problems.

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: Probabilistic models
Indicative price: € 20
Optional: no
Language : Dutch
Number of Pages : 400
Available on Ufora : No
Available through Student Association : Yes

References

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Course content-related study coaching

1. The lecturer announces office hours for questions related to the theory.
2. The education counselors and teaching assistants are available for questions related to the exercises.
3. Interactive support via Ufora.

Assessment moments

end-of-term assessment

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

Written assessment with open-ended questions, Written assessment

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

Written assessment with open-ended questions, Written assessment

Examination methods in case of permanent assessment

Possibilities of retake in case of permanent assessment

not applicable

Calculation of the examination mark

Final exam only (100%).