



Faculty of Health, Science and Technology
Mathematics

Syllabus

Stochastic Methods

Course Code:	MAGB64
Course Title:	Stochastic Methods <i>Stokastiska metoder</i>
Credits:	7.5
Degree Level:	Undergraduate level
Progressive Specialisation:	First cycle, has less than 60 credits in first-cycle course/s as entry requirements (G1F)

Major Field of Study:
MAA (Mathematics)

Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2020-03-11, and is valid from the Autumn semester 2020 at Karlstad University.

Prerequisites

Registered on Mathematics 30 ECTS credits, including the courses Calculus and Geometry, 7.5 ECTS credits, and Calculus in several variables, 7.5 ECTS credits, of which 15 ECTS credits must be completed

Learning Outcomes

The aim of the course is that the student acquire knowledge in probability theory and fundamental methods of mathematical statistics relevant to applications in technology, natural sciences, and economy.

Upon completion of the course, students should be able to:

- give an account of central concepts, axioms, and theorems in probability and statistics theory,

- design stochastic models for simple random situations and experiments,
- apply and combine probability laws to calculate probabilities, expected values, variation and dependency measures in stochastic models,
- derive and analyse estimates and statistical methods based on probability theory results, and
- use statistical methods to draw conclusions from given statistical data and assess the degree of uncertainty involved.

Content

Probability theory: Sample spaces, events, and probabilities. Combinatorics. Independent events, conditional probabilities. Discrete and continuous random variables. Common probability distributions, especially the normal, exponential, binomial, and Poisson distributions. Functions of random variables. Expected values, variance, covariance, and correlation. The law of large numbers and the central limit theorem. Stochastic processes, random walks, and Poisson processes.

Statistical methods: The Chi-square and t-distributions. Point estimates, unbiased and consistent estimates. Estimation with the maximum likelihood and least squares methods. Confidence intervals and test of significance, especially of the normal, binomial, and Poisson distributions and in situations where the central limit theorem can be applied. Different forms of misleading statistics. Regression analysis.

Reading List

See separate document.

Examination

Assessment is based on a written exam. The number of examination opportunities is limited to three per academic year.

If students have a decision from Karlstad University entitling them to special pedagogical support due to a documented disability, the examiner has the right to give such students an adapted examination or to examine them in a different manner.

Grades

One of the grades Fail (U), Pass (G), or Distinction (VG) is awarded in the examination of the course. For students in Engineering programmes, one of the grades U (Fail), 3 (Pass), 4 (Not without distinction) or 5 (Distinction) is awarded in the examination of the course.

Quality Assurance

Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other data and documentation. Students will be informed of the result of the evaluation and of any measures to be taken.

Course Certificate

A course certificate will be provided upon request.

Additional information

The local regulations for studies at the Bachelor and Master levels at Karlstad University stipulate the obligations and rights of students and staff.