Probability Theory

Sannolikhetsteori
6 credits

Programme course

732A63

Valid from: 2022 Autumn semester

Determined by	**Main field of study**	
The Quality Board at the Faculty of Arts and Sciences	Statistics	
Date determined	**Course level**	**Progressive specialisation**
2016-09-30	Second cycle	A1F
Revised by	**Disciplinary domain**	
Course and Programme Syllabus Board at the Faculty of Arts and Sciences	Technology	
Revision date	**Subject group**	
2022-06-15	Statistics	
Offered first time	**Offered for the last time**	
Autumn semester 2016		
Department	**Replaced by**	
Institutionen för datavetenskap		

Course offered for

- Master's Programme in Statistics and Machine Learning

Entry requirements

- Bachelor's degree equivalent to a Swedish Kandidatexamen of 180 ECTS credits in one of the following subjects:
    - statistics
    - mathematics
    - applied mathematics
    - computer science
    - engineering
- Completed courses in
    - calculus
    - linear algebra
    - statistics
    - machine learning
    - programming
- English corresponding to the level of English in Swedish upper secondary education (Engelska 6)
  Exemption from Swedish
- At least 30 ECTS credits passed from semester 1 and 2 Master's Programme in Statistics and Machine Learning, including the course Machine Learning 9 ECTS credits, or the equivalent

Intended learning outcomes

After competition of the course, the students shall be able to:

- use the major univariate and multivariate probability distributions in solving theoretical and practical problems in probability

- derive probability distributions of functions of random vectors

- analyze probability models by moment generating functions and other transforms

- analyze probability models by conditioning

- account for basic modes of stochastic convergence and derive limit distributions.

Course content

The course provides a theoretical foundation for models and methods based on the concept of probability. The course comprises:
- probability distributions for univariate and multivariate random variables,

- expected value, variance, moments,

- joint distribution, conditional distribution, independence,

- the elements of the Bayesian approach,

- transforms,

- order statistics,

- multivariate normal distribution and its properties,

- types of convergence and convergence theorems.

Teaching and working methods

The course consists of lectures and exercise sessions. The lectures are devoted to presentations of theories, concepts and methods. Mathematically oriented problems are solved in the exercise sessions.
Homework and independent study are a necessary complement to the course.
Language of instruction: English.

Examination

Written examination.
Detailed information about the examination can be found in the course's study guide.

If special circumstances prevail, and if it is possible with consideration of the nature of the compulsory component, the examiner may decide to replace the compulsory component with another equivalent component.

If the LiU coordinator for students with disabilities has granted a student the right to an adapted examination for a written examination in an examination hall, the student has the right to it.

If the coordinator has recommended for the student an adapted examination or alternative form of examination, the examiner may grant this if the examiner assesses that it is possible, based on consideration of the course objectives.

An examiner may also decide that an adapted examination or alternative form of examination if the examiner assessed that special circumstances prevail, and the examiner assesses that it is possible while maintaining the objectives of the course.

Students failing an exam covering either the entire course or part of the course twice are entitled to have a new examiner appointed for the reexamination.

Students who have passed an examination may not retake it in order to improve their grades.

Grades

ECTS, EC

Other information

Planning and implementation of a course must take its starting point in the wording of the syllabus. The course evaluation included in each course must therefore take up the question how well the course agrees with the syllabus.

The course is conducted in such a way that there are equal opportunities with regard to sex, transgender identity or expression, ethnicity, religion or other belief, disability, sexual orientation and age.

If special circumstances prevail, the vice-chancellor may in a special decision specify the preconditions for temporary deviations from this course syllabus, and delegate the right to take such decisions.