

Statistics and Probability

Programme course

6 credits

Statistik och sannolikhetslära

TNIU66

Valid from: 2017 Spring semester

Determined by
Board of Studies for Industrial
Engineering and Logistics

Date determined
2017-01-25

Main field of study

Mathematics, Applied Mathematics

Course level

First cycle

Advancement level

G1X

Course offered for

- Civil Engineering, B Sc in Engineering
- Air Transportation and Logistics, Bachelor's Programme
- Civic Logistics, Bachelor's Programme

Entry requirements

Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Prerequisites

A first course in mathematics at university level.

Intended learning outcomes

The course aims to provide an introduction to mathematical modeling of random trials and to statistical methods and concepts. It shall also demonstrate applications relevant to the programs for which it is given. After the course the student will be able to:

- analyze the distribution of a dataset for the central value and dispersion, such as mean, median and standard deviation, and visualize this.
- describe different approaches to the concept of probability.
- calculate probabilities of events, using concepts and tools such as independence, conditioning, incompatibility, complement event, union, intersection, combinatorics, tree diagram.
- formulate a probabilistic model using random variables, also with the central limit theorem, and use it to determine the characteristics of its distribution and calculate probabilities.
- calculate point estimates of expected value, variance, standard deviation, probability and intensity, and assess their suitability.
- calculate confidence intervals for the expected value (with and without a known standard deviation), probability and intensity, and interpret the results.
- formulate and implement hypothesis testing, and therein interpret the concepts of strength functions and P-value.
- conduct a correlation analysis and interpret the results.
- set up and interpret a linear regression model with two variables, determine whether a linear model is applicable and assess the reliability of estimates of both expected values as well as of individual observations.
- use computer support for all calculations where relevant.

Course content

- Probability: the concepts of probability. Sample space and event. Set theory and combinatorics. Conditional probabilities, Bayes' Theorem and the concept of independent events. Discrete and continuous random variables with distribution measures such as expected value, variance / standard deviation, covariance and correlation. The most common probability models, including uniform, binomial, poisson, exponential and normal distribution model. The Central Limit Theorem.
- Statistics: Descriptive statistics with the concepts of mean, median and standard deviation, and visualizations. Point and interval estimates of the expected value (with and without a known standard deviation), probability and intensity. Point estimation of variance and standard deviation. Hypothesis testing, including P-value and intensity function. Correlation. Linear regression for two variables, including control of suitability and determination of confidence and prediction intervals.

Teaching and working methods

Teaching is done in lectures, problem classes and laboratory work.

Examination

TEN1	Written examination	4.5 credits	U, 3, 4, 5
LAB1	Laboratory work	1.5 credits	U, G
UPG1	Optional assignments for bonus on final exam	0 credits	U, G

Bonus on final exam from assignments is valid for one year.

Grades

Four-grade scale, LiU, U, 3, 4, 5

Other information

Supplementary courses:

Courses in simulation, quantitative logistics etc.

Department

Institutionen för teknik och naturvetenskap

Director of Studies or equivalent

George Baravdish

Examiner

Michael Hörnquist

Education components

Preliminary scheduled hours: 42 h

Recommended self-study hours: 118 h

Course literature

Gunnar G. Lövås, Statistik - metoder och tillämpningar, Liber AB, Malmö, 2006.

Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://stydokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.