

# Mathematical Statistics, second course

Programme course

6 credits

Matematisk statistik I, fortsättningskurs

TAMS65

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

G2X

## Course offered for

- Industrial Engineering and Management - International, M Sc in Engineering
- Mathematics
- Industrial Engineering and Management, M Sc in Engineering

## Specific information

Supplementary courses:

Multivariate Statistical Methods, Experimental Design and Biostatistics, Signal Theory, Quality Technology, Six Sigma Quality.

## 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

Knowledge of probability, calculus and algebra is assumed and some familiarity with matrix algebra.

## Intended learning outcomes

The course is intended to give basic knowledge of the theory and methods of statistical inference, i.e. how to use observed data to draw conclusions about phenomena influenced by random factors. By the end of the course, the student should be able to:

- use an appropriate probability model to describe and analyse observed data and draw conclusions concerning interesting parameters;
- derive point estimators of parameters and analyse their properties;
- understand the principles of statistical inference based on confidence intervals and hypothesis testing;
- construct confidence intervals and test hypotheses using observed data, draw conclusions and describe the uncertainty;
- explore the nature of the relationships between two or several variables by using simple or multiple linear regression models and discuss the adequacy of the models;
- find probability models and statistical methods in applications from engineering, economy and science and evaluate the results;
- use suitable software (e.g., Matlab, R or similar) for certain types of statistical analyses.

## Course content

Chi-square-, t-, F-distribution. Point estimation, properties of estimators, the method of maximum likelihood, the method of moments and the least squares method. Confidence intervals and tests of hypotheses for one or several samples especially for normal, binomial and Poisson distribution and when the central limit theorem can be applied. Chisquare tests. Random vectors, mean vectors and covariance matrices. The multivariate normal distribution.

Multiple regression, estimation of parameters, confidence intervals, prediction, analysis of variance table, selection of variables and transformations.

Suitable statistical software is used for regression analysis.

## Teaching and working methods

Teaching is consists of lectures and lessons. Obligatory computer exercises are included in the course.

## Examination

LAB1	Exercise	1 credits	U, G
TEN1	Examination	5 credits	U, 3, 4, 5

## Grades

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

## Other information

Supplementary courses: Multivariate Statistical Methods, Experimental Design and Biostatistics, Signal Theory, Quality Technology, Six Sigma Quality.

## Department

Matematiska institutionen

## Director of Studies or equivalent

Ingegerd Skoglund

## Examiner

Martin Singull

## Course website and other links

<http://courses.mai.liu.se/GU/TAMS65>

## Education components

Preliminary scheduled hours: 56 h

Recommended self-study hours: 104 h

## Course literature

G. Blom, J. Enger, G. Englund, J. Grandell, L. Holst: Sannolikhets teori och statistikteori med tillämpningar. Studentlitteratur. Grundläggande regressionsanalys (kompendium). Formel- och tabellsamling i matematisk statistik, utgiven av matematiska institutionen.

## 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](http://stydokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva).