



**LUNDS UNIVERSITET**  
Lunds Tekniska Högskola

*Course syllabus*

## **Matematisk statistik, allmän kurs** **Mathematical Statistics, Basic Course**

**FMSF20, 7,5 credits, G2 (First Cycle)**

**Valid for:** 2023/24

**Faculty:** Faculty of Engineering, LTH

**Decided by:** PLED I

**Date of Decision:** 2023-04-14

### **General Information**

**Main field:** Technology.

**Compulsory for:** D3, E3

**Language of instruction:** The course will be given in Swedish

### **Aim**

The course is intended to give the student the basics in mathematical modelling of random variation and an understanding of the principles behind statistical analysis. It shall also give the students a toolbox containing the most commonly used models and methods, as well as the ability to use these in practical situations. The student shall also be able to handle dependence between observations.

The course fills two purposes, providing a fundamental knowledge of mathematical statistics, as well as giving a foundation for further studies.

The fundamental knowledge is essential for those who, in their professional lives, will not necessarily be involved in statistical analyses on a daily basis, but who, on occasion, will be expected to perform basic statistical tests and present the results for their colleagues. They will also be expected to be able to read and assess the analyses of others.

The main purpose of the course is to provide a basis for further studies. Both in stochastic modelling and analysis of random phenomena in time and/or space, and in the application areas, such as telecommunications, economics, signal processing, logistics, and process control. The focus therefore lies in probability theory and stochastic modelling of both independent and dependent data.

## Learning outcomes

### *Knowledge and understanding*

For a passing grade the student must

- be able to relate questions regarding random variation and observed data to the concepts of random variables, distributions, and relationships between variables,
- be able to explain the concepts of independence, probability, conditional probability, distribution, expectation, variance, and covariance,
- be able to calculate the probability of an event, and the expectation and variance from a given distribution,
- be able to describe fundamental techniques for statistical inference and be able to use them on basic statistical models, as well as modify them to fit more complicated models.

### *Competences and skills*

For a passing grade the student must

- be able to construct a simple statistical model describing a problem based on a real life situation or on a collected data material,
- be able to use a computational program for simulation och interpretation of statistical models, as well as for data analysis,
- be able to choose, modify, perform, and interpret a statistical procedure that answers a given statistical problem,
- be able to use statistical terms within the field in writing.

### *Judgement and approach*

For a passing grade the student must

- be able to examine a statistical model and its ability to describe reality.

## Contents

Data analysis. Descriptive statistics. Axioms of probability. Conditional probability, independent events. Stochastic variables and functions of the same. Expectation, variance, and covariance. Normal distribution, binomial distribution, and other important distributions for measurements and frequencies. Conditional distributions and conditional expectations. Point estimates and their properties. Maximum likelihood and Least squares. Principles of interval estimates and hypothesis testing. Methods for normally distributed observations. Approximative methods based on the normal distribution. Estimates of proportions. Correlation. Linear univariate and multiple regression.

## Examination details

**Grading scale:** TH - (U,3,4,5) - (Fail, Three, Four, Five)

**Assessment:** Written exam, computer exercises and computational ability test

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

### Parts

**Code:** 0115. **Name:** Examination.

Credits: 6. Grading scale: TH. Assessment: Written examination.

**Code:** 0215. **Name:** Laboratory Work.

Credits: 1. Grading scale: UG. Assessment: Computer exercises.

**Code:** 0315. **Name:** Computational Ability Test.

Credits: 0,5. Grading scale: UG. Assessment: Computer based test

## Admission

### Admission requirements:

- FMAA01 Calculus in One Variable or FMAA05 Calculus in One Variable or FMAA50 Calculus or FMAB30 Calculus in Several Variables or FMAB35 Calculus in Several Variables or FMAB50 Calculus in One Variable A2 or FMAB70 Calculus in One Variable B2
- FMAA01 Calculus in One Variable or FMAA05 Calculus in One Variable or FMAA50 Calculus or FMAB30 Calculus in Several Variables or FMAB35 Calculus in Several Variables or FMAB60 Calculus in One Variable A3 or FMAB70 Calculus in One Variable B2

**Assumed prior knowledge:** Calculus in one and several variables and Linear algebra.

**The number of participants is limited to:** No

**The course overlaps following course/s:** FMSF30, FMSF35, FMSF40, FMSF45, MASB03, FMSF50, FMSF55, FMSF70, MASB02, FMSF75, MASA01, FMSF80, MASA02

## Reading list

- Blom, G, Enger, J, Englund, G, Grandell, J, Holst, L: Sannolikhetsteori och statistikteori med tillämpningar. Studentlitteratur, 2017, ISBN: 9789144123561.
- Matematisk Statistik, Matematikcentrum: Matematisk Statistik kompletterande övningar. KFS, 2006.

## Contact and other information

**Director of studies:** Johan Lindström, [studierektor@matstat.lu.se](mailto:studierektor@matstat.lu.se)

**Course administrator:** Susann Nordqvist, [expedition@matstat.lu.se](mailto:expedition@matstat.lu.se)

**Course homepage:**

<https://www.maths.lu.se/utbildning/civilingenjoersutbildning/matematisk-statistik-paa-civilingenjoersprogram/>