



**LUNDS UNIVERSITET**  
Lunds Tekniska Högskola

*Course syllabus*

# **Matematisk statistik**

## **Mathematical Statistics**

**FMSF70, 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:** B3, BME3, K3, N3

**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 emphasis lies on models and methods for analysis of experimental data and measurement errors.

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 to 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 to their colleagues. They will also be expected to be able to read and assess the analyses of others.

The course shall also give a basis for further studies, particularly in design of experiments and methods for multidimensional data (Chemometrics).

### **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, distribution, expectation, and variance,
- be able to calculate the probability of an event and the expectation from a given distribution,
- be able to describe fundamental techniques for statistical inference and be able to use them on basic statistical models,
- be able to explain the purpose and principles of experimental design.

#### *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 and interpretation of statistical models, as well as for data analysis,
- be able to choose, perform, and interpret a statistical procedure that answers a given statistical problem,
- be able to use statistical terms within the field in writing,
- be able to present a statistical analysis in a technical report.

#### *Judgement and approach*

For a passing grade the student must

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

## **Contents**

The basis in probability theory and inference, confidence intervals, statistical methods such as design of experiments and regression analysis. Applications: measurement value analysis, different types of errors and their propagation; comparisons of means and variations; concepts and methods for quality control, estimations of proportions; regression analysis, calibration; factorial designs, optimization of experimental parameters, response surfaces. Applications in chemical and biotechnical engineering are of particular interest.

## **Examination details**

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

**Assessment:** Written exam, computer exercises, project report 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:** 0118. **Name:** Computational Ability Test.

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

**Code:** 0218. **Name:** Examination.

**Credits:** 5,5. **Grading scale:** TH. **Assessment:** Written exam

**Code:** 0318. **Name:** Project Work.

Credits: 1,5. Grading scale: UG. Assessment: Computer exercises and written project report.

## Admission

### Admission requirements:

- FMAA01 Calculus in One Variable or FMAA05 Calculus in One Variable or FMAB30 Calculus in Several Variables or FMAB35 Calculus in Several Variables or FMAB45 Calculus in One Variable A1 or FMAB50 Calculus in One Variable A2 or FMAB65 Calculus in One Variable B1 or FMAB70 Calculus in One Variable B2
- FMAA01 Calculus in One Variable or FMAA05 Calculus in One Variable or FMAB30 Calculus in Several Variables or FMAB35 Calculus in Several Variables or FMAB45 Calculus in One Variable A1 or FMAB60 Calculus in One Variable A3 or FMAB65 Calculus in One Variable B1 or FMAB70 Calculus in One Variable B2
- FMAA01 Calculus in One Variable or FMAA05 Calculus in One Variable or FMAB30 Calculus in Several Variables or FMAB35 Calculus in Several Variables or FMAB50 Calculus in One Variable A2 or FMAB60 Calculus in One Variable A3 or FMAB65 Calculus in One Variable B1 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:** FMSF20, FMSF25, FMSF30, FMSF35, FMSF40, FMSF45, MASB03, FMSF50, FMSF55, MASB02, FMSF75, MASA01, FMS086, MASA02, FMSF80

## Reading list

- Olbjer, L.: Experimentell och industriell statistik. 2000.
- Lena Zetterqvist och Johan Lindström: Räkna med variation - Ett arbetsmaterial i sannolikhetslära och statistisk inferens. Studentlitteratur, 2017, ISBN: 9789144113142.

## Contact and other information

**Director of studies:** Studierektor Johan Lindström, studierektor@matstat.lu.se

**Course administrator:** Susann Nordqvist, expedition@matstat.lu.se

**Course homepage:**

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

**Further information:** The laboratory work consists of computer exercises. The course is also given for chemists at the faculty of science with the code MASB02.