Course syllabus

Mathematical Statistics
Matematisk statistik

FMSF30, 5.0 credits, G2 (First Cycle)

Valid for: 2025/26
Faculty: Faculty of Engineering LTH
Decided by: PLED I
Date of Decision: 2025-03-28
Effective: 2025-05-05

General Information

Depth of study relative to the degree requirements: First cycle, in-depth level of the course cannot be classified
Mandatory for: IBYA2
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 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 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.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

- be able to relate questions regarding random variation and observed data, as they appear in applications , 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 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.

Competences and skills
For a passing grade the student must

- be able to construct a simple statistical model describing a problem based an a real life situation or on a collected data material,
- 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.

Contents

The course contains fundamental concepts in probability theory, inference theory, and regression analysis.

In probability theory the concepts used are random variables and distributions for describing variation and random phenomena, often related to engineering applications. Different distributions, such as binomial, Poisson, normal, exponential, and log normal distributions, are studied and the concept of expectation and variance of a distribution is introduced. Special attention is paid to the normal distribution and its property as a limit distribution.

In inference theory we start with observed data and estimate parameters in simple probability models, and describe the uncertainty of the estimates. Emphasis is placed on the relationship between the model and the reality based problem, as well as the conclusions that can be drawn from observed data. In this analysis we use basic techniques, such as confidence intervals and hypothesis testing. Examples of applications are given.

In regression analysis we study how the relationship between two or more variables can be described. Most often the relationship will be linear.

Examination details

Grading scale: TH - (U, 3, 4, 5) - (Fail, Three, Four, Five)
Assessment: Written examination.

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.

Modules
Code: 0117. **Name:** Mathematical Statistics.

Credits: 5.0. **Grading scale:** TH - (U, 3, 4, 5). **Assessment:** Written exam

Admission

Assumed prior knowledge: FMAA50 Calculus and FMAA55 Mathematics, Linear Algebra.
The number of participants is limited to: No
Kursen överlappar följande kurser: MASB02 MASB03 FMS601 FMSF35 FMSF40 FMAF30 VTVA30 FMSF20 FMSF45 FMSF50 FMSF55 FMSF70 FMSF75 MASA01 FMSF32

Reading list

- Vännman K, Jonsson A: Matematisk statistik - 3:e upplagan. Studentlitteratur, 2020, ISBN: 9789144133249.

Contact

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Course homepage: https://www.maths.lu.se/utbildning/hoegskoleingenjoersutbildning/

Further information

The course may not be included together with the course VTVA30 eller FMSF32.