Course syllabus

Matematisk statistik - kompletterande projekt
Mathematical Statistics - Complementary Project

FMSF25, 2,5 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

Elective for: V2
Language of instruction: The course will be given in Swedish

Aim

The course is intended to give the student those parts that are missing in the "högskoleingenjör"-education regarding the basics in mathematical modelling of random variation and understanding of the principles behind statistical analysis, in particular computer analysis of observed data, hypothesis testing, and regression analysis.

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 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 on a real life situation or on a collected data material,

- be able to examine a statistical model and its ability to describe reality,
- 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 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. Different distributions, such as binomial, Poisson, normal, exponential, and log normal distributions. Simulations from the distributions and studies of the models are performed in Matlab.

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.

In regression analysis we study how the relationship between two or more variables can be described. Most often the relationship will be linear. Models using indicator variables can occur. We study techniques for comparing and choosing among different models. This part rests heavily on the use of Matlab.

Examination details

Grading scale: UG - (U,G) - (Fail, Pass)
Assessment: 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: 0117. **Name:** Laboratory Work.
Credits: 2. **Grading scale:** UG. **Assessment:** Computer exercises and written project report.
Code: 0217. **Name:** Computational Ability Test.
Credits: 0,5. **Grading scale:** UG. **Assessment:** Computer based test

Admission

Admission requirements:

- FMAF30 Mathematical Statistics or FMSF30 Mathematical Statistics

Assumed prior knowledge: Bachelor of Science in Engineering, Civil Engineering (Helsingborg)
The number of participants is limited to: No
The course overlaps following course/s: FMSF01, FMSF50, FMSF55, FMSF70, MASB02, FMSF75, FMSF32, FMSF80

Reading list

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

Contact and other information

Director of studies: 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-ci vilingenjoersprogram/
Further information: Only for those having read Civil Engineering in Helsingborg and needing to augment FMSF30 (previously FMAF30) 5hp with 2.5hp Mathematical statistics in order to get the equivalent of FMSF50 7.5hp. The course is given twice a year and follows the computer exercises and project on FMSF50 in lp2 och lp4, respectively. Application is handled by the programme.