



LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Försöksplanering Design of Experiments

FMSF65, 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.

Elective Compulsory for: W3

Elective for: BME4, D4, E4, F4, F4-bm, MLIV1, MWIR2, N4, Pi4-biek

Language of instruction: The course will be given in English

Aim

This is a basic course in designing experiments and analyzing the resulting data. It is intended for engineers, physical/chemical scientists and scientists from other fields such as biotechnology and biology. The course deals with the types of experiments that are frequently conducted in industrial settings. Its objective is to learn how to plan, design and conduct experiments efficiently and effectively, and analyze the resulting data to obtain objective conclusions. Both design and statistical analysis issues are discussed. Opportunities to use the principles taught in the course arise in all phases of engineering and scientific work, including technology development, new product design and development, process development, and manufacturing process improvement. Applications from various fields of engineering (including chemical, mechanical, electrical, materials science, industrial, etc.) will be illustrated throughout the course.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- be able to explain and use basic methods in factorial experiments,
- be able to explain and use basic methods in analysis of variance with fixed and random

effects, regression and analysis of covariance.

Competences and skills

For a passing grade the student must

- be able to plan a factorial experiment,
- be able to suggest an experimental plan suitable for a given problem,
- be able to structure and analyse sets of data using a computer package and critically examine the result,
- be able to, both in written reports and orally at seminars, account for the solutions of statistical problems

Contents

Simple design with fixed and random effects. Simultaneous confidence intervals. Requirements for analysis of variance: transformations, model validation, residual analysis. Factorial design with fixed, random, and mixed effects. Additivity and interaction. Complete and incomplete designs. Randomised block designs, Latin squares and confounding. Regression and analysis of covariance.

Examination details

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

Assessment: Written exam, written project report and computer exercises.

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:** Examination.

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

Code: 0217. **Name:** Projekt Work.

Credits: 2. **Grading scale:** UG. **Assessment:** Written project report

Code: 0317. **Name:** Laboratory Work.

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

Admission

Admission requirements:

- FMAA20 Linear Algebra with Introduction to Computer Tools or FMAA21 Linear Algebra with Numerical Applications or FMAB20 Linear Algebra or FMSF20 Mathematical Statistics, Basic Course or FMSF25 Mathematical Statistics - Complementary Project or FMSF32 Mathematical Statistics or FMSF45 Mathematical Statistics, Basic Course or FMSF50 Mathematical Statistics, Basic Course or FMSF55 Mathematical Statistics, Basic Course or FMSF70 Mathematical Statistics or FMSF75 Mathematical Statistics, Basic Course or FMSF80 Mathematical Statistics, Basic Course
- FMAB30 Calculus in Several Variables or FMAB35 Calculus in Several Variables or FMSF20 Mathematical Statistics, Basic Course or FMSF25 Mathematical Statistics - Complementary Project or FMSF32 Mathematical Statistics or FMSF45 Mathematical Statistics, Basic Course or FMSF50 Mathematical Statistics, Basic Course or FMSF55 Mathematical Statistics, Basic Course or FMSF70 Mathematical Statistics or FMSF75

Mathematical Statistics, Basic Course or FMSF80 Mathematical Statistics, Basic Course

Assumed prior knowledge: Basic mathematical statistics and programming experience.

The number of participants is limited to: No

The course overlaps following course/s: FMS072, MASC05

Reading list

- Box, Hunter, and Hunter: Statistics for experimenters, Design, Innovation, and Discovery, 2nd Edition. Wiley, 2005, ISBN: 978-0-471-71813-0.
- Douglas C. Montgomery: Design and Analysis of Experiments, 10th Edition. Wiley, 2019, ISBN: 978-1-119-49244-3.

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-civilingenjoersprogram/>

Further information: The course is also given at the Faculty of Science with the code MASC05. One of the two course books will be sufficient.