Syllabus for

Academic year 2020/2021 >

TMS032 - Experimental design and sampling

Försöksplanering och urvalsteori

Syllabus adopted 2019-02-22 by Head of Programme (or corresponding)
Owner: MPENM
7,5 Credits
Grading: TH - Pass with distinction (5), Pass with credit (4), Pass (3), Fail
Education cycle: Second-cycle
Major subject: Mathematics
Department: 11 - MATHEMATICAL SCIENCES
This course round is given every other year. Is given 2020/2021 but not 2021/2022

Teaching language: English
Application code: 20120
Open for exchange students: No
Status, available places (updated regularly): Yes

Credit distribution

Module	Sp1	Sp2	Sp3	Sp4	Summer course	No Sp	Examination dates
0118 Examination 7,5c Grading: TH			7,5c				17 Mar 2021 am J

In programs
MPENM ENGINEERING MATHEMATICS AND COMPUTATIONAL SCIENCE, MSC PROGR, Year 2 (elective)

Examiner:
Marina Axelson-Fisk

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Eligibility
General entry requirements for Master's level (second cycle)
Applicants enrolled in a programme at Chalmers where the course is included in the study programme are exempted from fulfilling the requirements above.

Specific entry requirements
English 6 (or by other approved means with the equivalent proficiency level)
Applicants enrolled in a programme at Chalmers where the course is included in the study programme are exempted from fulfilling the requirements above.

Course specific prerequisites
Knowledge corresponding to a basic course in mathematical statistics and the course MVE190 Linear Statistical models

Aim
The aim of the course is to provide the student with knowledge of different methods in statistical experimental planning and sampling theory, to systematically plan, implement and analyze statistical surveys to obtain as much information as possible. The methods presented are widely used in technology and science to streamline and optimize processes and are a natural part of quality assurance in industry and society.

Learning outcomes *(after completion of the course the student should be able to)*
On successful completion of the course the student will be able to
* Describe the classical methods in optimal experimental design, their similarities and differences regarding design, execution and analysis.
* Choose a suitable experimental design for different problems and situations.
* Design an experiment from beginning to end, including planning and execution, data collection, statistical analysis and interpretation of results.
* Describe the most common sampling methods, in which situations they apply, and the corresponding population estimates and variance estimates.
* Describe and analyze both linear and non-linear estimation situations.
Course content

Content
Topics covered in the course include

Experimental design:
* General design of experiments.
* Factorial and reduced factorial experiments.
* Analysis of variance (one-way and multi-factor ANOVA).
* Mixed effects models.
* Split plot designs.
* Linear and non-linear regression and optimala designer.
* Responce surface methods.
Sampling theory:
* Basic techniques of simple random sampling, systemic sampling, stratified sampling, probability proportional to size sampling, cluster sampling, and multi-stage sampling.
* Population estimation using Horvitz-Thompson, ratio and regression estimation.
* Variance estimation for complex sample designs, including they Taylor series expansion method, balanced repeated sampling, and jackknife methods.
* Optimal allocation and optimal sampling schemes.
* Model based inference and pseudo likelihood-methods.

Organisation

Lectures and exercise sessions.

Literature

To be decided

Examination including compulsory elements

Written exam