



Faculty of Technology and Science

Graduate Level Course

Course Approval

The syllabus was approved by the Faculty of Technology and Science on May 4, 2011, and is valid from the Autumn semester of 2011 at Karlstad University.

Course Code: 2KEA001

Course Name

Applied Statistics and Design of Experiments, 8 ECTS Credits
(Tillämpad statistik och försöksplanering, 8 Swedish higher education credits)

Language of Instruction

English.

Degree Level

Doctoral level.

Prerequisites

Students with a Bachelor's or Master's degrees admitted to the PhD programme in the fields of Technology or Science.

Learning Outcomes

The aim of the course is that students develop practical knowledge in the use of statistical methods and mathematical tools for the design and execution of experimental investigations and to evaluate and interpret results from such investigations.

Upon completion of the course, the students should be able to

- use descriptive statistics to characterize experimental data.
- use statistical significance tests and regression techniques to evaluate and examine differences in results between different sets of experimental data.
- plan, execute, evaluate and interpret results from series of experiments based on factorized experimental designs.

Content and Form of Instruction

Classical statistical methods:

different types of experimental errors; statistical distributions; confidence intervals; significance tests (F-, t-, χ^2 -test, ANOVA); linear and multiple linear regression. This part of the course is treated in lectures and mandatory computer exercises and is assessed on the basis of hand-in assignments.

Orientation about multivariate data analysis techniques:

classical classification techniques, such as discriminant analysis, the kNN method and dendrograms; principal component analysis (PCA); partial least squares regression (PLS). This part of the course is treated in lectures and mandatory computer exercises.

Design of experiments:

methods and strategies for screening, optimization and robustness testing; factorized, reduced and composite designs of experiments; evaluation of multiple regression models; response surface methodology and optimization; simplex techniques.

This part of the course is treated in lectures and mandatory computer exercises, but mainly through computer-based individual studies. Assessment is based on students' application of design of experiments to their own field of research, the result of which is presented in a written report and in seminars with all course participants. Participation in the seminars is mandatory.

Reading List

See separate document.

Examination

See Content and Form of Instruction (above) and Grades (below).

Grades

One of the grades Fail (U) or Pass (G) is awarded in the examination of the course. The Pass grade will be awarded upon successful completion of all course components including mandatory exercises and seminars.

Course Certificate

A course certificate will be provided upon request.

Quality Assurance

Follow-up relating to learning conditions and goal-fulfillment takes place both during and upon completion of the course in order to ensure continuous improvement. Course assessment is based on student views and experiences as reported in written course evaluations and/or group discussions. The course evaluation is summarized and submitted to the Faculty Board by the department responsible for the course no later than the semester after its execution.