

MSG500, LINEAR STATISTICAL MODELS, 7.5 credit points

Level: undergraduate

1. Authorisation.

The course plan has been authorised by the vice-dean of the Department of Mathematical Sciences on November 9, 2006, to be valid from July 1, 2007.

Educational field: Mathematical Sciences

2. Educational context

The course is part of the Bachelor Program in Mathematical Sciences. It is also open for students outside the program who meet the course prerequisites.

3. Prerequisites

MSG100 and MSG200 or other courses covering the material of these courses.

4. Goals and learning outcomes

Having passed the course, the student should

- understand the common mathematical structure of regression and analysis of variance models, based on the normal distribution, and be able to use these models
- be able to identify data analysis situations for which general linear models apply naturally and to estimate parameters, predict future observations and test linear hypotheses concerning the data using suitable computer programmes
- have a basic understanding of generalized linear models, the logistic regression model in particular, and relevant algorithms and statistical analytical tools
- be able to identify in which context the generalized linear models are natural to use
- have a basic knowledge of some General Linear Model software.

5. Course description

The course covers the following topics:

- multidimensional normal distributions
- general linear models in linear algebra terms
- statistical analysis of general linear models using algebraic tools like projections, generalized matrix inverses and quadratic forms
- the duality of hypothesis tests and confidence sets
- Sheffe's and Tukey's methods for multiple tests and confidence intervals
- noncentral t- and F-distributions and their use for test power computations
- tolerance and prediction intervals
- graphical methods for model validation
- introduction to generalizations towards general heteroscedastic and covariance structures
- generalized linear models with link function for some exponential families
- estimation algorithms for various link functions.
- hypothesis testing and confidence intervals for linear combinations of parameters in the generalized linear models: the binomial, Poisson and multinomial distribution cases
- generalized residuals and their use.

6. Literature

See separate list.

7. Assessment

At least two mini-projects written in groups.

8. Grades

The grade levels are Fail (U), Pass (G), and High Pass (VG). A wish for an ECTS grade should be reported to the examiner at the beginning of the course.

9. Course evaluation

In the middle of the course the teacher arranges a feedback discussion with the students and at the end of the course the students will be asked to answer a questionnaire. The results of the questionnaire will be processed by the teacher together with student representatives.

10. Additional information