

- Faculté des sciences économiques
- www.unine.ch/seco

Statistical Modelling and Design of Experiments

Characteristics

- 3 ECTS credits
- Compulsory course for master in statistics
- Spring Semester
- Course : 2 hours / Exercises : 2 hours
- Evaluation : written exam 2 hours
- Prerequisite : Linear Regression

Teaching Team

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Objectives

Statistical experimental design allows experimenters to get the maximum of relevant information with a minimum experimental effort. Most often the problems that practitioners face can be framed by the two questions: which are the most important factors of the system (model identification) and what is the best settings of the factors (prediction). Students will learn the fundamental concepts of factor, bias, interaction, confounding, how to construct fractional factorial designs and how to optimize a response surface. The methodology of robust engineering design (Taguchi method) used in modern quality improvement will also be taught. Although this course is an applied statistics course with many real examples, it provides insights in fundamental statistical modelling issues.

Contents

- What is statistical experimental design
- Full Factorial Designs with Factors at Two-Level
 - Factors, interaction
 - Analysis with normal and half-normal plot
- Fractional Factorial Designs with Factors at Two-Level
 - Construction
 - Confounding of effects
 - Analysis
- Special Issues
 - Design resolution
 - Blocking
 - Other screening designs
- Modelling
 - Advantage of orthogonal designs

- Model comparison
 - Test of lack-of-fit
- Optimization techniques
 - Simplex
 - Evop
 - Steepest ascent
- Response Surface Analysis
 - Central composite designs
 - Other designs
 - Canonical analysis
- Special Issues
 - Simultaneous optimization of many responses
 - Analysis of transformation
- Robust Engineering Design
 - Control and noise factors
 - Taguchi method
 - Parameter design optimization

Exercises

Textbooks

- Box G.E.P., Hunter W. and Hunter S.J., *Statistics for Experimenters: Design, Innovation, and Discovery*, 2nd Edition, Wiley (2005).
- Myers R.H. and Montgomery D.C., *Response Surface Methodology: Process and Product Optimization Using Designed Experiments*, Wiley (1995).
- Wu C.F.J, Hamada M., *Experiments: Planning, Analysis, and Parameter Design Optimization*, Wiley (2000).