

Course name: Multivariate statistics and experimental design

Syllabus approved:

Number of credits: 2 credits

Subject: Food science

Part of research school: Focus on Food and Biomaterials

Education cycle: Third (postgraduate)

Marking scale: Passed / Failed

Prerequisites:

Basic knowledge in statistics

Course objective:

After completing the course the student shall be able to

- recognize the importance of the selection of the proper experimental design
- choose the most appropriate multivariate procedures for a given design
- explain how different type of data can be analyzed by statistical methods
- use Principal Component Analysis,
- compute the results of multivariate regression analysis: Multilinear Regression (MLR), Principal Component Regression (PCR), Partial Least Squares (PLS)
- interpret statistical results in the light of research questions

Content:

The course will give an overview of common multivariate statistical methods in food science and biology. Major aspects of study experimental design will also be discussed.

Specifically, the course will cover following topics:

- Factorial Design
- Data transformations
- Multilevel Categorical Design (General Factorial)
- Split-Plot Designs
- Multivariate concepts
- Data import and handling
- Principal Component Analysis
- Outlier detection
- Regression methods
- Validation methods

Literature:

Will be provided by the course leader.

Examination:

Participation in 80% of the lectures and assignment prior to the lectures, which consists of reading part of the course material, data analysis using software provided by the course, and preparation of a short rapport based on the data analysis.

Additional information:

The course is intended for PhD-students. Post-docs can attend the course if positions are available.

Responsible department and Research Schools:

Department of Molecular Sciences

Location:

Uppsala

Schedule 2019 (December 9-12)

Design of Experiments (Mon-Tue)

Monday (9-17)

1. Introduction
2. Full factorial designs
3. Analysis of DOE data – An overview
4. Experimental objective: Screening

Tuesday (9-17)

5. Analysis of DOE data – Causes of bad models
6. Post-screening actions
7. Experimental objective: Optimization
8. Basic Principles of Design Space Estimation

Multivariate Data Analysis (Wednesday-Thursday)

Wednesday (9-17)

- Chapter 1 – Introduction
- Chapter 2 – Master your data using PCA
- Chapter 3 – The importance of raw data analysis and pre processing
- Chapter 4 – PCA applications
- 4a) Counterfeit modelling
- 4b) Raw material characterization
- 4c) Process modelling of a continuous chemical process

Thursday (9-17)

Chapter 5 – OPLS for regression, prediction and improved interpretation

Chapter 6 – Visualization and documentation of results

Chapter 7 – OPLS applications

7a) Discriminant analysis (OPLS-DA)

7b) Multivariate calibration

7c) Process modelling of a batch fermentation process