Process Analysis 7.5 credits M7004K

Processanalys

Course syllabus admitted: Autumn 2023 Sp 1 - Present

DECISION DATE
2022-06-15

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Process Analysis 7.5 credits M7004K

Processanalys

Second cycle, M7004K

Education level	Grade scale	Subject	Subject group (SCB)
Second cycle	G U 3 4 5	Mineralteknik	Chemical Engineering

Entry requirements

90 credits in Chemical Engineering, including the courses S0001M Mathematical Statistics, M0048M Linear Algebra and Calculus and K0024K Sustainable Process and Chemical Engineering or corresponding. Good knowledge in English, equivalent to English B/6.

Selection

The selection is based on 30-285 credits

Course Aim

The student gets the possibility to develop skills in research planning, optimisation and multivariate data analysis with their application to industrial processes.
After completion the student should be able to:
• Identify situations where multivariate data analysis is applicable,
• Use common techniques from multivariate analysis,
• Establish research plans with factorial design,
• Evaluate results from statistically planned experiments,
• Interpret results from MVA and planned tests in process technology terms,
• Formulate hypothesis on process results based on MVA data.

Contents

The course concerns the extraction of information from chemical process data. It contains experimental design (factorial designs with several levels, reduced factorial designs, mixture designs), multiple linear regression and response surface models. Within multivariate analysis the following is treated:
* Multivariate discriminant analysis(SIMCA),
* Principal component analysis (PCA),
* Partial-least-squares-regression (PLS), time lags in data,
* Multivariate statistical process control (MSPC) and batch-wise statistical process control (BSPC).
Neural nets are considered as alternatives to PCA and PLS.

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Realization

Each course occasion´s language and form is stated and appear on the course page on Luleå University of Technology's website.

The instruction consists of lectures, lessons, compulsory assignments-laboratory classes, a project and compulsory seminars. For each assignment and the project, the students have to provide a report, which should be technically, statistically and grammatically correct. The project report should be in a standard report format typical for an industrial report. It is defended at a joint seminar. The lectures are used to give the students the possibility to plan and conduct multivariate analysis, and to explain theoretical concepts. Guest lecturer from the industry shows how MVA is used by the process industry. PC-lessons are used to train calculation procedures and techniques, PC laboratory classes are done in groups and introduce the assignments, which are finished later, and they train the students in groups to plan and do MVA and to report the results in technical compilations. The project is used to (in groups) describe, analyse, evaluate, interpret, report and present the result of MVA on a process technology data set. It is reported at two seminars, the first to describe for the other groups the data material and the intended work. The second seminar is used for reporting of the work done, and there is a prepared opponent group. The opponent group have written a short assessment of responding group's report and must during the seminar orally criticise the report.

Examination

If there is a decision on special educational support, in accordance with the Guideline Student's rights and obligations at Luleå University of Technology, an adapted or alternative form of examination can be provided. Assignments, the project and the seminars are compulsory. Assignments, seminars, the project and the opposition are each awarded points based on the attained level. Assignments and reports must be delivered in time or there will be an automatic deduction of points. The total points production determines the grand grade of the course, and it is given on the scale 3 4 5. For grade 3, the student must be able to describe procedures for, and to conduct, routine MVA analysis. For grade 4, the student must be able to evaluate and interpret process results by multivariate techniques and to report the investigation results. For grade 5, the student must be able to apply the acquired skills to a new data material, interpret, report and present the results and to defend the conclusions.

Unauthorized aids during exams and assessments

If a student, by using unauthorized aids, tries to mislead during an exam or when a study performance is to be assessed, disciplinary measures may be taken. The term "unauthorized aids" refers to aids that the teacher has not previously specified as permissible aids and that may assist in solving the examination task. This means that all aids not specified as permissible are prohibited. The Swedish version has interpretative precedence in the event of a conflict.

Remarks

Compulsory attendance at the first scheduled lesson/lecture.

Transition terms

2500

Course offered by

Department of Civil, Environmental and Natural Resources Engineering

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Modules

Code	Description	Grade scale	Cr	Status	From period	Title
0003	Assignment reports	G U 3 4 5	4.5	Mandatory	S23	
0004	Project	G U 3 4 5	3	Mandatory	S23	

Last revised

by Assistant Director of Undergraduate Studies Eva Gunneriusson, Department of Civil, Environmental and Natural Resources Engineering 2022-06-15

Syllabus established

by the Department of Chemical Engineering and Geosciences 2007-02-28

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