



Mathematics for minimization processes Matematik för minimeringsprocesser

2.5 credits

2.5 högskolepoäng

Ladok Code: FRRMM01

Version: 1.0

Established by:

Valid from: Spring 2018

Education Cycle: Third cycle

Research Subject: Resource Recovery

Prerequisites: The student fulfills the admission requirements for the MSc-program in resource recovery (or equivalent).

Grading Scale: Fail (U) or Pass (G)

Content

Mathematics for minimization processes is developed for PhD-students at the University of Borås who in their research use mathematical methods/models to describe thermodynamic, chemical and mechanical processes. The utilization of mathematical models, for example in order to predict and to verify the results of practical experiments, is increasing and thereby also the need for better understanding of the mathematical expressions and concepts that these models are based upon. At the University of Borås research in the field of combustion and thermal processes, computational modeling and structural mechanics is being conducted, areas which all, in some form, utilizes numerical minimization methods. For the PhD-student, knowledge in how these methods operate is essential and provides the foundation for the writing of scientifically correct, complete and distinct dissertations. This course deals with the mathematical concepts that are the foundation of minimization processes, processes which are actually applied in research performed at the University of Borås and in the above mentioned areas. The creation of regression lines, given a number of data points and the minimization of Gibbs free energy are two examples of minimization processes that will be considered during the course.

Learning Outcomes

The student should, after completion of the course, be able to:

1. Knowledge and understanding

- 1.1 present and discuss the use of the least square method when minimizing vector expressions,
- 1.2 present and discuss the use of the least square method when drawing regression lines,
- 1.3 present and discuss the use of partial derivatives and Lagrange multipliers in minimization processes.

2. Skills and abilities

- 2.1 handle the least square method,
- 2.2 handle partial derivatives and Lagrange multipliers.

3. Evaluation and approach

- 3.1 analyze and evaluate available models and the minimization processes which they are based upon and be able to choose a suitable method/model given a minimization assignment.

Forms of Teaching

The teaching consists of lectures with practical exercises.

The language of instruction is English.

Forms of Examination

- Project report: Learning outcomes: 1.1 1.3, 2.1, 2.2, 3.1. 1.5 credits. Grading scale: fail/pass (U/G)

- Oral presentation of exercises: Learning outcomes: 1.1 1.3, 2.1, 2.2. 1 credit. Grading scale: fail/pass (U/G)

Student rights and obligations at examination are in accordance with guidelines and rules for the University of Borås.

Literature and Other Teaching Methods

The course material, in form of compendia and exercises, will be made available by the responsible teachers on the web-based teaching platform PING PONG. The course material is in English.

Student Influence and Evaluation

The head of the academy and the teacher responsible for the course are obligated to systematically and regularly gather the students opinions about the course. The results of these surveys should be reported back to the students and also be used for the future development of the course.

Miscellaneous

This course is primarily intended for students admitted to the doctoral program in resource recovery.