FSF3840 Numerical Nonlinear Programming 7.5 credits

Numerisk ickelinjär programmering

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for FSF3840 valid from Spring 2019

Grading scale

P, F

Education cycle

Third cycle

Specific prerequisites

A Master degree including at least 30 university credits (hp) in in Mathematics (Calculus, Linear algebra, Differential equations and transform method), and further at least 6 hp in Mathematical Statistics, 6 hp in Numerical analysis and 6 hp in Optimization.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

That the student should obtain a deep understanding of the mathematical theory and the numerical methods for nonlinear programming.

After completed course, the student should be able to

- Derive optimality conditions for different classes of nonlinear optimization problems.
- Explain how the method of steepest descent, the method of conjugate gradients, quasi-Newton methods and Newton methods work for unconstrained optimization, both linesearch methods and trust-region methods
- Explain methods related to the above for equality-constrained problems
- Explain methods related to the above for inequality-constrained problems
- Explain how interior methods for semidefinite programming work

Course contents

The course deals with algorithms and fundamental theory for nonlinear finite-dimensional optimization problems. Fundamental optimization concepts, such as convexity and duality are also introduced.

The main focus is nonlinear programming, unconstrained and constrained. Areas considered are unconstrained minimization, linearly constrained minimization and nonlinearly constrained minization. The focus is on methods which are considered modern and efficient today.

Linear programming is treated as a special case of nonlinear programming.

Semidefinite programming and linear matrix inequalities are also covered.

Disposition

Lectures.

Course literature

Announced when the course is offered.

Examination

- INL1 - Assignment, 7.5 credits, grading scale: P, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

The examination is by homework assignments and a final oral exam.

Other requirements for final grade

Homework assignments and a final oral exam.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.