



COURSE SYLLABUS

Optimization Driven Design, 6 credits

Optimeringsdriven design, 6 högskolepoäng

Course Code: TODS27	Education Cycle: Second-cycle level
Confirmed by: Dean Mar 1, 2016	Disciplinary domain: Technology (95%) and social sciences (5%)
Valid From: Jan 1, 2017	Subject group: MT1
Version: 1	Specialised in: A1F
Reg number: JTH 2016/608-313	Main field of study: Product Development

Intended Learning Outcomes (ILO)

After completing the course, the student shall

Knowledge and understanding

- have knowledge about how structural and design optimization can be used during the design process.
- be able to show knowledge about how fundamental basic optimization algorithms are used.
- have understanding about how optimization driven design is used in the development of sustainable products.

Skills and abilities

- show ability to use response surfaces optimization in structural analyses.
- show the ability to perform sensitivity analyses.

Judgement and approach

- show ability to perform a major optimization driven design project.

Contents

The course includes the following topics:

- Introduction to optimization driven design, structural optimization, size-, shape- and topology optimization, as well as surrogate based design optimization.
- The steepest descent method, Newton's method, Karush-Kuhn-Tucker conditions (KKT), linear programming, the Simplex method.
- Response surface optimization, successive response surface optimization, linear and quadratic response surfaces, the normal equation, advanced surrogate models (Kriging and RBFN).
- Design of Experiments (DoE): factorial, Koshal, Box-Behnken, face centered design, S-optimal DoE.
- Robustness analysis, normal distribution, histogram, box plots, scatter plots, Monte Carlo simulations.

Type of instruction

Lectures, tutorials and home assignments.

The teaching is conducted in English.

Prerequisites

Passed courses 180 credits in first cycle, at least 90 credits within the major subject Mechanical Engineering, and 21 credits Mathematics, and completed course Non-linear Finite Element Analysis, 9 credits, and English Language requirements corresponding to English 6 or English B in the Swedish upper secondary school (or the equivalent).

Examination and grades

The course is graded 5,4,3 or Fail.

Registration of examination:

Name of the Test	Value	Grading
Examination ¹	5 credits	5/4/3/U
Project work	1 credit	U/G

¹ Determines the final grade of the course, which is issued only when all course units have been passed.

Other information

Exemption from entry requirement allowed according to the selection groups of the program, where the course is included.

Course literature

The literature is preliminary until one month before the course starts.

Title: Introduction to engineering design optimization

Author: Chinyere Onwubiko

Publisher:

ISBN: 9780201476736