



## COURSE SYLLABUS

# Optimization Driven Design, 6 credits

*Optimeringsdriven design, 6 högskolepoäng*

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

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### 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 <sup>1</sup>	5 credits	5/4/3/U
Project work	1 credit	U/G

<sup>1</sup> 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