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COURSE SYLLABUS

FEA and Optimization Driven Design, 7.5 credits

FEA och optimeringsdriven design, 7.5 högskolepoäng

Course Code:	TFOS22	Education Cycle:	Second-cycle level
Confirmed:	Feb 01, 2025	Disciplinary domain:	Technology
Valid From:	Sep 01, 2025	Subject group:	Mechanical Engineering
		Specialised in:	A1F Second cycle, has second-cycle course/s as entry requirements
		Main field of study:	Product Development

Intended Learning Outcomes (ILO)

On completion of the course the student shall:

Knowledge and understanding

- show familiarity with basic optimization algorithms and their use
- demonstrate comprehension of how optimization driven design is used in the development of sustainable products
- show familiarity with the current state of the art within the area of design optimization

Skills and abilities

- demonstrate the ability to implement selected optimization algorithms in software
- demonstrate the ability to formulate and solve structural optimization problems with finite element analysis
- demonstrate the ability to conduct parameter optimization with finite element method
- demonstrate the ability to perform engineering calculations with optimization methods for small problems

Judgment and approach

- demonstrate the ability to perform sensitivity analyses
- demonstrate the ability to judge whether FE simulation/optimization results are reasonable or not.

Content

The aim of the course is to provide knowledge and ability to perform engineering calculations with optimization methods. The student will formulate, implement and solve optimization problems.

The course includes the following elements:

- Optimization methods for constrained and unconstrained problems.
- Gradient and non-gradient optimization methods.
- Finite element method for optimization problems.
- Sensitivity analysis and design of experiments.
- Structural (shape and topology) and process optimization for components manufactured e.g. from metal alloys and polymers.Calculations with optimization methods for small problems
- Implementation of selected optimization algorithms in MATLAB.
- Simulation-based optimization laboratory sessions using a commercial finite element software.

Type of instruction

Lectures, computer assignments, exercises.

Language of instruction is in English.

Entry requirements

Passed courses of at least 90 credits within Materials and Manufacturing, Mechanical Engineering, Chemical Engineering, Product Development or Engineering Physics, and 15 credits Mathematics included multivariable calculus and completed courses in Numerical Analysis, 7,5 credits and Continuum Mechanics, 7,5 credits (or the equivalent). Proof of English proficiency is required.

Examination and grades

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

Registration of examination:

Name of the Test	Value	Grading
Computer assignments	5 credits	G/U
Written examination [1]	2.5 credits	5/4/3/U

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

Course literature

Please note that changes may be made to the reading list up until eight weeks before the start of the course.