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 by:	Dean Mar 1, 2022	**Disciplinary domain:**	Technology
Valid From:	Aug 1, 2022	**Subject group:**	MT1
Version:	1	**Specialised in:**	A1F
		Main field of study:	Product Development

Intended Learning Outcomes (ILO)

After a successful 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

Judgement and approach
• demonstrate the ability to perform sensitivity analyses
• demonstrate the ability to judge whether FE simulation/optimization results are reasonable or not

Contents

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.

The teaching is conducted in English.

Prerequisites

Passed courses at least 90 credits within the major subject Mechanical Engineering, 15 credits Mathematics included multivariable calculus and completed courses in Numerical Analysis, 7,5 credits and Continuum Mechanics, 7,5 credits, proof of English proficiency is required (or the equivalent).

Examination and grades

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

Registration of examination:

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

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

Course literature

The literature list for the course will be provided eight weeks before the course starts.