



LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Datorbaserad konstruktionsanalys 1

Computer Based Engineering, Design Analysis 1

MMKN46, 7,5 credits, A (Second Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED M

Date of Decision: 2023-04-11

General Information

Elective for: M4-me, M4-pu, MD4

Language of instruction: The course will be given in English on demand

Aim

This course aims to provide students with insight into how advanced computer aids through an extensive integration can be utilised to reduce lead times while increasing efficiency and quality in development and construction projects. Such aids are introduced in this course for the following activities: modelling, analysis and optimization through concrete design tasks and examples from industry and the research world. In the course, optimization methods such as those focusing on single phenomena, as well as those suitable for complex combinations of phenomena are also introduced. The course provides insight into how computer-based tools can be utilized to use material in a resource-efficient manner, which ties into goal 9 and 12 of Agenda 2030.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- be able to analyse, as well as motivate the choice of analysis and optimization method type for a simple engineering design problem exposed to static structural loads, flow and/or thermal loads
- be able to create an analysis model based on the chosen analysis type
- be able to introduce necessary boundary conditions into the analysis model
- execute the actual analysis program

- be able to evaluate the analysis and optimization results achieved and suggest possible changes in the existing design solution
- be able to communicate the process as well as the results of the analysis/es orally and in writing

Competences and skills

For a passing grade the student must

- based on the assignment description, carry out a complete analysis and optimization of a design solution regarding structure, thermally and/or of flow
- have acquired the kind of insights into the methods, technology and terminology regarding current computer based design analyses so that the student is able to communicate his or her results to an industrial company verbally and in writing

Judgement and approach

For a passing grade the student must

- be able to reflect on the results achieved and suggest possible further analyses and/or design changes in the original design solution

Contents

Design analysis in the given context primarily concerns the utilisation of computer based analysis methods/techniques for quantitative problem solving in the engineering design process. The finite element method (FEM) is primarily dealt with for the analysis of these mechanical systems.

An important part of the design analysis is modelling and handling of the interactions between the different software (structural, thermal and flow) utilised. The goal is to transfer the obtained analyses results into the actual design solution, thus facilitating the preceding design activities.

The course also covers how a given design solution subjected to a single or complex phenomena is given a mathematical formulation (model), which in turn can be transformed into an optimization problem. Based on this formulation a suitable optimization method and tool is selected.

The software utilised in the course are: ANSYS WorkBench, Autodesk CFD, modeFRONTIER and PTC Creo.

The lectures are focused on modelling and selection of analysis type, optimization methods and design of experiments as well as showing industrial applications. Guest lecturers with deep insights in specific techniques will be invited.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)

Assessment: For a final passing grade the student must pass the two required problem-based individual assignments. The final grade is the average of the two assignment grades. Please note that the assignments can be resubmitted with improvements if the student does not receive a passing grade the first time, but they will only be credited with the

minimum number of points to pass.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Admission

Assumed prior knowledge: FHL064 Finite Element Method or equivalent.
MMK010/MMKA15/MMKA25 Manual and Computer Aided Drafting in Mechanical Engineering.

The number of participants is limited to: 60

Selection: Completed university credits within the programme. Priority is given to students enrolled on programmes that include the course in their curriculum

The course overlaps following course/s: MMKN45

Reading list

- Burman, Å., Lecture material from the Division of Machine Design, LTH, 2007.

Contact and other information

Course coordinator: Axel Nordin, axel.nordin@design.lth.se

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Course homepage: <http://www.product.lth.se/education/>