



LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Teknisk modellering: Bärverksanalys

Engineering Modelling: Analysis of Structures

VSMF05, 7,5 credits, G2 (First Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED V

Date of Decision: 2023-03-21

General Information

Main field: Technology.

Elective Compulsory for: V3

Language of instruction: The course will be given in Swedish

Aim

Analysis of bars, beams, trusses and frames belongs to the most common computing tasks for a structural engineer. The aim of the course is to give knowledge of how to define physically correct models and to use them for solving engineering problems. The generality of the element based analysis method is emphasised by the fact that also one-dimensional flow problems such as thermal conduction, diffusion and groundwater flow are treated.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- be able to theoretically model bars, beams, trusses, frames and one-dimensional flow problems such as thermal conduction, diffusion and groundwater flow.

Competences and skills

For a passing grade the student must

- be able to use element based displacement method to analyse trusses, frames and one-dimensional flow problems.

- be able to choose suitable models for analysing structures, including dividing the structure into elements, defining degrees of freedom, and defining support conditions and loads.
- be able to perform computer based analysis of the structures in question.
- be able to present a clear written description of basic conditions, model for analysing the structure, results, and conclusions from computations performed manually and using computer, for different applications.

Judgement and approach

For a passing grade the student must

- be able to assess the consistency of the obtained results in relation to the assumed conditions and the defined computational model.

Contents

Matrix algebra. Introduction to discrete systems. Bar and beam elements. Element-based analysis of trusses and frames. Aspects of modelling; symmetry, hinges in frames, subsidiary conditions, static condensation, reduced systems of equations. One-dimensional scalar problems; thermal conduction, diffusion, groundwater flow, pipe network and electrical circuit. Beams and supports on elastic foundation. Frames and trusses considering geometric nonlinearity and instability. Frames and trusses considering material nonlinearity.

Examination details

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

Assessment: Hand-in assignments, laboratory assignment and written examination.

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.

Parts

Code: 0116. **Name:** Engineering Modelling: Analysis of Structures.

Credits: 6. **Grading scale:** TH. **Assessment:** Written examination

Code: 0216. **Name:** Hand-in Assignments.

Credits: 1,5. **Grading scale:** UG. **Assessment:** Written presentation of hand-in assignments

Admission

Assumed prior knowledge: VSMA05 Structural Mechanics OR FME602 Structural Mechanics OR VSMA20 Structural Mechanics AND FMA420 Linear algebra OR FMAB20 Linear Algebra AND FMAA05 Calculus in One Variable.

The number of participants is limited to: No

The course overlaps following course/s: VSM150

Reading list

- Dahlblom, O. och Olsson, K.-G.: Strukturmekanik, Modellering och analys av ramar och fackverk. Studentlitteratur, 2015, ISBN: 9789144107868.

Contact and other information

Course coordinator: Henrik Danielsson, henrik.danielsson@construction.lth.se

Course homepage: <http://www.byggmek.lth.se>