



LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Finite elementmetoden - olinjära system Finite Element Method for Non-linear Systems

FHLN20, 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: BME5, F4, F4-bs, F4-bem, M4-bem, Pi4-bs, Pi4-bem, V5-ko

Language of instruction: The course will be given in English

Aim

The aim of the course is to provide an understanding about modelling and simulation of non-linear structural and material problems using the finite element method.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- understand the basic assumptions when establishing the finite element formulation for a structural non-linear problem
- understand the basic assumptions in large deformations and large strains
- utilize the finite element method in structural non-linear problems

Competences and skills

For a passing grade the student must

- be able to establish a non-linear finite element formulation
- write a non-linear finite element program
- establish the weak form of different non-linear problems

Judgement and approach

For a passing grade the student must

- have the capacity to analyze, model and simulate structural non-linear problems using the finite element method

Contents

The course treats the finite element method where both geometrical and material nonlinearities are present. The fundamental equations for large deformations and strains and the various strain measures and stress measures are introduced. The corresponding strong and weak forms of the equilibrium equations are discussed, both in their spatial and material format. The nonlinear finite element formulation is derived from the general three-dimensional case. Emphasis is given to the fundamental principles in the FE-formulation. During the course, the participants are going to establish their own nonlinear FE-program.

Examination details

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

Assessment: The course consists of a series of seminars. In parallel computer laborations the numerical implementation is given. Examination is based on the two project assignments, which consider both theoretical and numerical issues. The projects are graded and the final grade is based on the total grade.

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

Admission requirements:

- FHLF01 Finite Element Method or FHLF20 Finite Element Method or VSMN30 The Finite Element Method - Structural Analysis

The number of participants is limited to: No

Reading list

- Choice of:
- CALFEM - A finite element toolbok to MATLAB, Studentlitteratur.
- Matti Ristinmaa, Introduction to non-linear finite element method, Div. of Solid Mechanics.

Contact and other information

Course coordinator: Professor Matti Ristinmaa, Matti.Ristinmaa@solid.lth.se

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