The Finite Element Method; advanced course

Programme course

6 credits

Finita elementmetoden, fortsättningskurs

TMHL62

Valid from: 2017 Spring semester

Determined by
Board of Studies for Mechanical
Engineering and Design

Date determined
2017-01-25

Main field of study

Mechanical Engineering

Course level

Second cycle

Advancement level

A1X

Course offered for

- Mechanical Engineering, M Sc in Engineering
- Mechanical Engineering, Master's programme

Entry requirements

Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Prerequisites

Solid Mechanics, Finite elements, Continuum Mechanics, Fortran

Intended learning outcomes

The purpose of the course is to provide extensive, in-depth knowledge of the Finite Element Method (FEM). The essential goal is to give the student the understanding of the applicability, implementation, use and limitations of the method so that it can be used critically and in such a manner that the numerical behavior in the method can be explained using a well substantiated theory formulation.

Course content

Finite-element formulation of second- and fourth-degree one dimensional boundary-value problems by means of weak formulation and a Galerkin approximation. Manual calculation of bar and beam problems using the above formulation. FEM formulation of second-degree multidimensional boundary-value problems applied to linear elasticity. Isoparametric formulation. Stress calculations. Numerical and computer aspects. Assembly, storage and solution of rigidity equations. Patch tests and Conditioning numbers. Support reactions, Substructure techniques, prescribed displacements and transformations. Adaptivity. Contact problems, Linear stability, Geometric non-linearity, Newton,s method.

Teaching and working methods

Teaching is in the form of lectures, classes and laboratory exercises.

Examination

UPG1	Exercises	1.5 credits	U, G
TEN1	Written examination	4.5 credits	U, 3, 4, 5

Grades

Four-grade scale, LiU, U, 3, 4, 5

Department

Institutionen för ekonomisk och industriell utveckling

Director of Studies or equivalent

Peter Schmidt

Examiner

Bo Torstenfelt

Course website and other links

http://www.solid.iei.liu.se/Education/

Education components

Preliminary scheduled hours: 48 h
Recommended self-study hours: 112 h

Course literature

Cook R. D.: Concepts and applications of Finite Element Analysis, (4:ed), Wiley,
2001.

Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.