Finite Element Methods in Linear Structural Mechanics

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Module number	Credits	Workload	Semester[s]	Duration	Group size
CE-P05/SE-C-2/FEM-I	6 CP	180 h	1. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Finite Element Methods in Linear Structural Mechanics	a) 4 WLH (60 h)	a) 120 h	a) each winter

Module coordinator and lecturer(s)

Prof. Dr. Roger A. Sauer

a) Prof. Dr. Roger A. Sauer

Admission requirements

Recommended previous knowledge:

Basics in Mathematics, Mechanics and Structural Analysis (Bachelor level)

Learning outcome, core skills

After successfully completing the module, the students

- have basic knowledge of the Finite Element Method (FEM),
- are able to transfer initial boundary value problems of structural mechanics into discretized calculation models based on FEM and thus to solve simple tasks of structural mechanics independently (e.g. calculation of truss structures, disc-like or volume structures),
- have advanced knowledge to understand the functionality of calculation programs based on FEM and to critically evaluate their results,
- are able to independently implement corresponding user-defined elements in FE programs and perform numerical analyses of beam and shell structures.

Contents

a)

The course covers the basic knowledge of linear FEM, which is based on the principle of virtual work.

In particular, the following topics are taught in the course:

- Isoparametric finite elements for trusses, two-dimensional elements, beams, three-dimensional volume elements for application in statics and dynamics,
- consistent explanation of the fundamentals (basic equations, principle of variation),
- Numerical integration, assembly of the elements to a discretized structure and the solution of the static and dynamic structure equation,
- Discussion of stiffening effects ("locking") and their avoidance.

Educational form / Language

a) Tutorial (2 WLH) / Lecture (2 WLH) / English

Examination methods

• Written exam 'Finite Element Methods in Linear Structural Mechanics' (120 min., Part of modul grade 100 %)

• Optional tasks to be solved at home and announced during the course, to get the bonus points for the exam.
Requirements for the award of credit points Passed final module examination
Module applicability • M.Sc. Computational Engineering • M.Sc. Subsurface Engineering • M.Sc. Civil Engineering
Weight of the mark for the final score Percentage of total grade [%] = 6 * 100 * FAK / DIV FAK: The weighting factors can be taken from the table of contents. DIV: The values can be taken from the table of contents.
Further Information