Advanced Finite Element Methods

Module-No./Abbreviation	Credits	Workload	Term	Frequency	Duration
CE-WP04/FEM-II	6 CP	180 h	2nd Sem.	Summer term	1 Semester

Courses	Contact hours	Self-Study	Group Size:
Advanced Finite Element Methods	4 SWS (60 h)	120 h	No Restrictions

Prerequisites
Finite Element Methods in Linear Structural Mechanics (CE-P05), Basic knowledge in Structural Mechanics

Learning goals / Competences
After successfully completing the module, the students

- are qualified to numerically solve nonlinear problems in engineering sciences by providing the methodological basis of the geometrically and physically nonlinear finite element method,
- are able to set up and implement simple models for damage analyses by user defined sub-programs,
- can perform structural analyses, where the 1st order theory is not valid (e.g. cables, membrane structures, load bearing and stability analyses exceeding the load bearing capacity), and they can assess the results.

Content
The main topics of the course are:

- formulation and finite element discretization of the basic equations for nonlinear materials and geometrically nonlinear analysis in structural mechanics
- development of algorithms for the solution of the underlying nonlinear material and structural equations
- application to analyze the structural behavior considering damage and large deformations
- algorithms for damage models within the finite element programs
- nonlinear stability analysis of structures
- finite element method for the solution of contact problems

Teaching methods / Language
Lecture (2h / week), Exercises (2h / week) / English

Mode of assessment
Written examination (120 min, 100%) / Optional seminar papers, partially with presentations, to get bonus points for the exam (60 hours, deadlines will be announced at the beginning of the semester)

Requirement for the award of credit points
Passed final module examination

Module applicability
MSc. Computational Engineering, MSc. Bauingenieurwesen

Weight of the mark for the final score
6 %

Module coordinator and lecturer(s)
Prof. Dr. techn. G. Meschke, Assistants

Further information