


Data:	TAFEM. MA. Nr. 3219 / Examination number: 42605	Version: 08.06.2017 	Start Year: SoSe 2018
Module Name:	Nonlinear Finite Element Methods		
(English):			
Responsible:	Kiefer, Björn / Prof. PhD.		
Lecturer(s):	Hütter, Gerafl / Dr. Ing. Kiefer, Björn / Prof. PhD. Roth, Stephan / Dr. Ing.		
Institute(s):	Institute of Mechanics and Fluid Dynamics		
Duration:	1 Semester(s)		
Competencies:	This course will enable students to understand and apply the theoretical foundations of Finite Elements Methods (FEM) for geometrically and physically nonlinear problems, with a particular focus on solid mechanics. Hands-on experience will be obtained in the exercises and practical application sessions regarding the coding of custom finite element routines as well as using commercial FE-analysis software packages. The students will thus be capable of selecting appropriate FE formulations for specific nonlinear mechanics problems, of developing and implementing the associated algorithms, and of verifying and analysing the numerical results. This knowledge is transferable to a broad spectrum of nonlinear problems described by partial differential equations in engineering and the natural sciences.		
Contents:	Most important ingredients are: <ul style="list-style-type: none"> • Weak form of the equilibrium conditions • FEM for physically nonlinear problems • FEM for coupled problems • FEM for dynamic problems • FEM for finite deformations • Programming of FEM codes with MATLAB. 		
Literature:	Belytschko, Liu, Moran: Nonlinear Finite Elements for Continua and Structures, John Wiley & Sons, 2000 Bonet, Wood: Nonlinear Continuum Mechanics for Finite Element Analysis, Cambridge University Press, 2008 Reddy: An Introduction to Nonlinear Finite Element Analysis, Oxford University Press, 2015 Wriggers: Nonlinear Finite Element Methods, Springer, 2008 Zienkiewicz, Taylor: The Finite Element Method, Butterworth-Heinemann, 2000		
Types of Teaching:	S1 (SS): Lectures (2 SWS) S1 (SS): Taught in English and German. / Exercises (1 SWS) S1 (SS): Taught in English and German. / Practical Application (1 SWS)		
Pre-requisites:	Recommendations: Einführung in die Methode der finiten Elemente, 2017-06-08 Numerische Methoden der Mechanik, 2017-06-08 Basic knowledge in engineering mechanics		
Frequency:	yearly in the summer semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: MP/KA (KA if 10 students or more) [MP minimum 30 min / KA 120 min] PVL: Preparation of an FEM coding assignment in MATLAB/Octave Possible in German. PVL have to be satisfied before the examination.		
Credit Points:	4		

Grade:	The Grade is generated from the examination result(s) with the following weights (<i>w</i>): MP/KA [<i>w</i> : 1]
Workload:	The workload is 120h. It is the result of 60h attendance and 60h self-studies. The time needed for the preparation and reworking of lectures and exercises is rather extensive due to the complexity of the topics addressed within this course and because of the programming exercises involved.