FRIEDRICH-ALEXANDER
UNIVERSITÄT
ERLANGEN-NÜRNBERG

TECHNISCHE FAKULTÄT

Elektrotechnik-Elektronik-Informationstechnik

EEI KOLLOQUIUM

NONLINEAR VIBRATIONS - 100 Years after DUFFING

Prof. Dr. Jörg Wallaschek
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Donnerstag, der 03.07.2014, 14^{15} Uhr
Raum: BR-LSE 01.030, Konrad-Zuse-Str. 3/5

Diskussionsleitung: Prof. Dr.-Ing. R. Lerch

Design problems in mechanical engineering often require the study of nonlinear vibrations. This lecture introduces typical sources of nonlinear system behaviour encountered in mechanical and electromechanical systems, like e.g. material behaviour, contact mechanics, friction, electromagnetics and fluid force fields. It adresses their relevance in the context of applications like drillstring dynamics, vibrations in turbomachinery, piezoelectric energy harvesting and ultrasonic process technologies. Analytical, numerical and experimental methods, including higher-order harmonic balance, nonlinear modal analysis and phase-controlled frequency response measurements will also be discussed. Special attention will be given to A) phenomena involving contact mechanics and friction, like the effect of friction reduction by superimposed ultrasonic vibrations, force generation in piezoelectric ultrasonic vibration motors, or frictional damping of turbine bladings by underplatform dampers and shroud interfaces, B) phenomena involving electromechanical coupling, like eddy-current damping and piezoelectric damping of turbine bladings or piezoelectric energy conversion in ultrasonic motors and energy harvesting devices. The lecture aims at providing a general understanding of the field of nonlinear vibrations in mechanical engineering rather than at giving a rigorous and detailed mathematical analysis of individual phenomena. Special focus will be given to modelling assumptions, their computational implementation and their experimental validation.