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## Seminar über Fragen der Mechanik

zu folgendem Vortrag wird herzlich eingeladen

Mittwoch, **23.06.2010, 12:00 Uhr, Martensstr. 1, Raum 0.031**

### Modified Shooting Method: Quasi-periodic Response, Instability and Chaos Analysis of a Non-linear Flexible Rotor Ball Bearing System

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A modified Shooting Method is developed by coupling the Non-autonomous Shooting Technique with a Fixed Point Algorithm (FPA) to analyze the quasi-periodic response of non-linear systems, in case of multiple excitations of incommensurate frequencies. The eigenvalues (Floquet multipliers) of the monodromy matrix provide information about stability and the nature of bifurcation of a quasi-periodic solution. The Wolf's algorithm with Gram-Schmidt orthogonalization is used to determine the Lyapunov exponents. The proposed modified shooting method is applied to obtain an almost periodic solution of a nonlinear flexible rotor-ball bearing system. A generalized Timoshenko beam FE formulation, which can be used for both flexible and rigid rotor systems with equal effectiveness, is developed. Nonlinearity effects in rolling element bearings arise from Hertzian contact force, deformation relationship and clearance between rolling elements and races. The system is bi-periodically excited due to varying compliance of ball bearing and rotating unbalance. The maximum values of Floquet multipliers and Lyapunov exponents are taken as signatures to determine the instability and chaotic nature of the nonlinear dynamical system.