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Technische Universität Berlin

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FG Kontinuumsmechanik und Materialtheorie (LKM)

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Ankündigung eines Gastvortrages

im Rahmen des Mechanik Seminars

zum Thema

Asymptotic homogenization and nonlinear elastic waves in periodic composite materials

Ort: Technische Universität Berlin, Gebäude MS,
Raum MS 209, Einsteinufer 5, 10587 Berlin

Mittwoch, 13. Juni 2012, 16.00 Uhr c.t.

Gastdozent: Prof. Igor V. Andrianov, RWTH Aachen, Germany

Abstract:

The paper aims to bridge the gap between the theory of nonlinear waves and higher-order microscopic models of composite materials. Propagation of strain waves in nonlinear solids with microstructure is studied. As an illustrative example, a layered composite material is considered. Geometrical nonlinearity is described by the Cauchy-Green strain tensor. Physical nonlinearity is predicted using the Murnaghan elastic potential.

The effective wave equation is derived by the higher-order asymptotic homogenization method. Asymptotic solutions of the cell problems are developed using series expansions in powers of the gradients of displacements. Approximate analytical expressions are obtained for the effective moduli.

The balance between nonlinearity and dispersion results in formation of stationary nonlinear waves. An asymptotic solution (for the case of weak nonlinearity) and the exact solution in elliptic functions are derived. A number of nonlinear phenomena are detected, such as generation of higher-order modes, localization, and solitary waves. Numerical results are presented and practical importance of the above mentioned effects is discussed