Oberseminar Nichtlineare Differentialgleichungen

Jun.-Prof. Christina Lienstromberg - Prof. Guido Schneider - Prof. Wolf-Patrick Düll

Prof. Christopher Chong

Bowdoin College

Dynamics of time-modulated, nonlinear phononic lattices

23. Juni 2023 - 10:15 – Raum 8.526

Abstract: The propagation of acoustic and elastic waves in time-varying, spatially homogeneous media can exhibit different phenomena when compared to traditional spatially varying, temporally homogeneous media. In this talk, the response of a one-dimensional phononic lattice with time-periodic elastic properties will be examined with experimental, numerical and theoretical approaches. For small-amplitude excitation, in agreement with linear theoretical predictions, wave-number band gaps emerge. The underlying instabilities associated to the wave-number band gaps are investigated with Floquet theory and the resulting parametric amplification is observed in both theory and experiments. In contrast to genuinely linear systems, large-amplitude responses are stabilized via the nonlinear nature of the magnetic interactions of the system, and results in a family of nonlinear time-periodic states. The bifurcation structure of the periodic states is studied. It is found the linear theory correctly predicts parameter values from which the time-periodic states bifurcate from the zero state. In the presence of an external drive, the parametric amplification induced by the wave-number band gap can lead to bounded and stable responses that are temporally quasiperiodic.

Gemeinsame Veranstaltungsreihe des Lehrstuhls Analysis und Modellierung
und der Abteilung für Differentialgleichungen

Institut für Analysis, Dynamik und Modellierung IADM
Pfaffenwaldring 57, 70569 Stuttgart