Einladung zum Oberseminar Mathematik in den Naturwissenschaften

Julius-Maximilians-Universität Würzburg
Lehrstuhl für Mathematik in den Naturwissenschaften

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Mathematical Aeroelasticity: Well-posedness and Long-time Behavior of Flow-Structure Interactions

This talk focuses on the underlying mathematics of the aeroelastic phenomenon *flutter*—i.e., the way that an elastic structure may become unstable in the presence of an adjacent flow of air. Under certain circumstances, a feedback occurs between elastic deformations and pressure dynamics in the airflow, resulting in sustained oscillations. A canonical example was seen in the Tacoma Narrows bridge (Washington, USA), which collapsed in 1940 while fluttering in 65 kph winds. Flutter is typically discussed in the context of aero-mechanical systems: buildings and bridges in wind, and flight systems. However, applications also arise in biology (snoring and sleep apnea), and in alternative energy technologies (piezoelectric energy harvesters). We will look at a variety of flow-structure interaction models which are partial differential equation systems coupled via an interface. After a brief discussion of relevant modeling, we will examine well-posedness and long-time behavior properties of PDE solutions for three different physical configurations that can exhibit aeroelastic flutter: (1) projectile paneling, (2) a bridge deck, (3) an elastic energy harvester. From a rigorous point of view, we attempt to capture the mechanism that gives rise to the flutter instability. Additionally, when flutter occurs, we attempt to describe its qualitative features through a dynamical systems approach, as well as how to prevent it or bring it about (stability).

Ort: Zoom video conference	Zeit: Freitag, 03.07.2020 um 15:00 Uhr

You are cordially invited to this lecture. Request the Zoom link from anja.schloemerkemper@mathematik.uni-wuerzburg.de

gez. Anja Schlömerkemper