

PDE seminar
University of Minnesota
Wednesday, October 17, 2012

Speaker: **Igor Chueshov (Kharkov National University, Ukraine)**

Title: **On some PDE models arising in gas/fluid-structure interaction**

Abstract: We present well-posedness and qualitative behavior results concerning several nonlinear PDE models which describe interaction of the elastic wall of a chamber with gas or fluid filling this chamber.

Our first model consists of a semilinear wave equation defined on a bounded domain, which is strongly coupled with the nonlinear (Berger or von Karman) plate equation acting only on a part of the boundary. This kind of models, referred to in the literature as structural acoustic interactions, arise in the context of modeling gas pressure in an acoustic chamber which is surrounded by a combination of hard (rigid) and flexible walls. The pressure in the chamber is described by the solution to a wave equation, while vibrations of the flexible wall are described by the solution to a plate equation. We also consider the dynamics of an elastic flexible plate with clamped boundary conditions immersed in a flow of gas.

Our next class of models deals with a coupled system consisting of linearized 3D Navier–Stokes equations in a bounded 3D domain and the classical (nonlinear) elastic plate equation on the boundary. We consider several types of coupling and present well-posedness results and show existence of a compact global attractor.

The results presented are partially based on joint studies in collaboration with F. Bucci, I. Lasiecka, I. Ryzhkova, and J. Webster.