Francesca Bucci, Università degli Studi di Firenze

Control theoretic properties of a fluid-structure interaction

In this talk we will deal with certain analytical properties of a well-recognized mathematical model for a fluid-structure interaction (FSI). The Partial Differential Equations system comprises linearized Navier-Stokes equations for the motion of a viscous, incompressible fluid filling a (3D) bounded domain, and an elastic (2D) plate equation for the displacements of a part of its boundary. We will first briefly report on well-posedness and stability results – along with explicit rates of uniform decay – for the free dynamics, recently established by Chueshov-Ryzhkova (2013), Avalos-Clark (2014) and Avalos-Bucci (2014, 2015), respectively. We will then discuss the major challenges which are encountered in the modeling of significant boundary control actions, as well as in the study of the associated optimal control problems (with quadratic functionals). A comparison with the case of a distinct FSI, describing the motion of a (3D) elastic body within an incompressible fluid, will be provided. (The talk is based on joint work with George Avalos (University of Nebraska-Lincoln, USA))