

TEMPLE UNIVERSITY  
Department of Mathematics

# Applied Mathematics and Scientific Computing Seminar

Wednesday, 11 March 2015, 4:00 p.m.  
Room 617 Wachman Hall

(refreshments and social at 3:45 p.m)

## An Augmented Method for Stokes-Darcy Fluid-Structure Interactions

by Zhilin Li

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**Abstract.** In this talk, a new coupling method, based on Cartesian meshes, is proposed for fluid-structure interactions between a fluid flow modeled by the Stokes equations, and a porous medium, modeled by Darcy's law. Such a model has many applications in mathematical biology, particularly in cell simulations. The idea is to introduce several interface variables so that the problems can be solved through several Helmholtz/Poisson equations for which a fast Poisson solver can be utilized. The augmented variables that have co-dimension one compared with that of the velocity and pressure are chosen so that the BJS conditions are satisfied. The method is second order accurate for the velocity and first order for the pressure. Numerical examples are also presented. One interesting question is how to solve the resulting Schur complement system efficiently.