

TEMPLE UNIVERSITY  
Department of Mathematics

# Applied Mathematics and Scientific Computing Seminar

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Room 617 Wachman Hall

## Finite Elements Methods for Interface Problems with Non-Aligned Meshes

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**Abstract.** Interface problems arise in several applications including heart models, cochlea models, aquatic animal locomotion, blood cell motion, front-tracking in porous media flows and material science, to name a few. One of the difficulties in these problems is that solutions are normally not smooth across interfaces, and therefore standard numerical methods will lose accuracy near the interface unless the meshes align to it. However, it is advantageous to have meshes that do not align with the interface, especially for time dependent problems where the interface moves with time. Remeshing at every time step can be prohibitively costly, can destroy the structure of the mesh, can deteriorate the well-conditioning of the stiffness matrix, and affect the stability of the problem. In this talk we present finite element methods for solving a class of interface problems where the finite element triangulation does not fit the interface. The methods are based on correction terms added to the right-hand side of the discrete formulation of the problem or by doubling the unknowns near the interface. We discuss the use of the proposed methods to solve Poisson and Stokes interface problems, transmission problem with high-contrast coefficients and fluid-structure interactions.