Department of Mathematical Sciences
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Colloquium

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Friday, September 12, 2014 at 3pm in Bell Hall 143

A Mixed Finite Element Method for Linear Poroelasticity

In this talk, we consider numerical algorithms for modeling of the time-dependent coupling between the fluid flow and deformation in elastic porous media. First, a new mixed finite element method for the 2D Biot's consolidation model of poroelasticity will be presented. This method is based on coupling two mixed finite element methods for each subproblem: the standard mixed finite element method for the flow subproblem and the Hellinger-Reissner formulation for the mechanical subproblem. Optimal *a-priori* error estimates are proved for both semi-discrete and fully-discrete problems. Then, we will discuss four iterative coupling schemes, known as drained, undrained, fixed-strain, and fixed-stress splits, in which the diffusion operator is separated from the elasticity operator and the two subproblems are solved in a staggered way while ensuring convergence of the solution at each time step. Some numerical results will be presented to confirm the convergence estimates and to show the accuracy and efficiency of the algorithms.