

APPLIED AND NUMERICAL ANALYSIS SEMINAR

Thursday April 21 Period 9

Speaker: Jiangguo Liu | Colorado State University

Title: New finite element solvers for poroelasticity problems

Abstract: This talk presents our recent results on reviving the 2-field approach (fluid pressure and solid displacement) for numerically solving poroelasticity problems. We choose quadrilateral and hexahedral meshes for spatial discretization since they are equally flexible in accommodating complicated domain geometry but involve less unknowns, compared to simplicial meshes. The Darcy equation is solved for fluid pressure by the novel weak Galerkin finite element methods, which establish the discrete weak gradient and numerical velocity in the Arbogast-Correa spaces. The elasticity equation is solved for solid displacement by the enriched Lagrangian elements, which were motivated by the Bernardi-Raugel elements for Stokes flow. These two types of finite elements are coupled through the implicit Euler temporal discretization to solve poroelasticity problems. Efficient strategies for implementation are briefly discussed. Then numerical experiments on benchmarks are presented to show that the new solvers are indeed locking-free. This talk is based on a series of joint work with several collaborators.