Department of Mathematical Sciences
The University of Texas at El Paso

Colloquium

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Friday, April 13, 2012 at 3 pm in Bell Hall 143

Mixed Finite Element Method for Coupled Flow and Geomechanics

Poroelasticity is the modeling of the time-dependent coupling between the deformation of porous materials and the fluid flow inside. Modeling the mechanical behavior of fluid-saturated porous media is of great importance in a wide range of science and engineering fields including reservoir engineering, soil mechanics, environmental engineering, and, more recently, biomechanical engineering. It has been well-known that standard Galerkin finite element methods produce unstable and oscillatory numerical behavior of the fluid pressure, which is known as *locking* in poroelasticity. Overcoming locking effects in poroelasticity has been a subject of extensive research by many researchers.

In the beginning of the talk, I will provide a brief introduction to finite element method. Then, I will present a numerical method that has been designed to overcome locking. The method is based on a coupling of two mixed finite element formulations for the flow and mechanics problems. The mixed formulation for the mechanics problem uses the total stress and displacement as primary unknowns. The main idea underlying this approach is to use a finite element space for the displacement that contains non-constant divergence-free vectors. I will discuss *a priori* error estimates and show some results of numerical simulations. Numerical results illustrate the accuracy of the method and also the effectiveness to overcome nonphysical pressure oscillations.

For further information, please contact Dr. Emil Schwab, eschwab@utep.edu
Refreshments will be served in front of the colloquium room,
15 minutes before the start of the colloquium.