

Department of Civil and Environmental Engineering Seminar Announcement

“...Modeling and Quantification of Anisotropy and Heterogeneity in Geomaterials....”

Presented by

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Abstract:

The growing worldwide energy demand calls for abundant and accessible sources of energy. To promote environmental and energy sustainability, it is crucial to reduce environmental impacts due to applications such as hydrocarbon recovery, unconventional energy resources and underground waste storage, along with enhancement of technologies such as carbon sequestration, geothermal energy and underground heat storage. These applications require an understanding of the behavior of the involved geomaterials (e.g. soils, shales and other rocks) at multiple scales, and the ability to predict their behavior under various conditions. Geomaterials are often anisotropic and heterogeneous, and consist of various phases that form complex structures persisting at multiple scales. Microstructural morphology of these materials has a great impact on their overall behavior such as deformation, failure and transport properties, and needs to be incorporated into the computational modeling efforts. This talk will consist of two main parts. The first part will focus on incorporating anisotropy into mechanistic models. An anisotropic thermo-plasticity framework will be presented for modeling the thermo-mechanical response of transversely isotropic geomaterials, which will then be used to predict the inception of shear band. The second part of the talk will focus on quantification of heterogeneity of geomaterials across scales using high-resolution imaging techniques. A stochastic framework will be described that uses high-resolution images to enhance low-resolution images obtained over larger fields of view by incorporating features below the resolution limit. The application of this method will be demonstrated using images of shale samples with two different resolutions and fields of view obtained using X-ray micro-tomography.

Monday, January 22, 2018
11:00 -12:00 pm
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