CEE AT ILLINOIS
Department of Civil and Environmental Engineering

GEO

## CEE 595F – Geotechnical Engineering Seminar

Friday, November 30, 2018 | 11:00 AM, Newmark Lab 3310

# *Design and Evaluation of Engineered Seals for Subsurface Service Environments*

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**Abstract:** Engineered seals provide critical containment in a variety of subsurface engineering application, ranging from disposal of nuclear waste to oil and gas development. For nuclear waste disposal, the durability of these seals may need to be demonstrably predictable for timescales on the order of $10^3$ years! Subsurface seals, generally constructed from Portland cement and/or bentonite clay, are subject to the complex dynamics of multi-scale phenomenon and multi-process coupling -- specifically thermo-hydrologic-mechanical-chemical (THMC) coupling. While THMC models represent the "holy grail" for predicting fate and transport in subsurface engineering applications, robust and efficient THMC have proved elusive. Instead subsets of process models (e.g. T, M, TH, THM, THC) are utilized and have proved adequate in many instances. This talk will cover highlights of the functional requirements for seals in subsurface service environments, using case studies of problems from nuclear waste storage and geologic storage of carbon dioxide. Examples of research results from these applications will show current design and predictive methods, as well as illustrate how a combined experimental and computational approach can be implemented to better understand the multi-scale, coupled processes that are critical to the design and prediction of subsurface seal performance.

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**Speaker Bio:** Ed Matteo is a Senior Member of Technical Staff at Sandia National Laboratories in Albuquerque, NM. Ed's research interests include fluid-mineral interfaces and reactive transport in porous media, esp. chemical durability/reactivity of cementitious materials and clay minerals. For the last few years, he has been Technical Lead on engineered barrier system evaluation and repository design for DOE-NE's *Used Fuel Disposition* and *Spent Fuel and Waste Science and Technology* Campaigns. Ed has a PhD in Chemical Engineering from Princeton University and a BS in Chemical Engineering from the University of New Mexico.