Abstract:
Imbibition and drainage of water through the pore spaces of granular media play a crucial role in all aspects of their behavior. Granular infrastructure materials which experience cycles of rain-freeze-thaw, undergo considerable damage to their structural integrity due to water imbibition. Pharmaceutical tablets, which are powder blends compacted to low porosity, rely on imbibition into their pore structure for drug dissolution and release. This process involves multiple transport phenomena at the pore scale that occur at different time scales. The proposed model therefore depends on the following coupled physical phenomena: (i) flow in porous media, (ii) inter-particle and intra-particle fluid diffusion, (iii) particle swelling, (iv) inter-particle contact forces, and (v) dissolution kinetics. In this talk, we will present a computationally efficient three-dimensional pore-network model of wetting and non-wetting fluids in the pore space of polydisperse granular systems and under capillary and gravitational forces. We will also briefly discuss the development and implementation of the coupled physical phenomena alluded to above.

Bio: Pedro Cidreiro is a 2 year PhD student, working with Prof. Marcial Gonzalez on modeling of transport phenomena in granular systems. He graduate with BSc in ME from Federal University of Uberlandia, Uberlandia (Brazil) 2014 and earned his MSc in ME and AAE at Technological Institute of Aeronautics with research focus on three dimensional hybrid Trefftz stress finite elements. His current research interests include multiphysic and multiscale modeling.

Faculty Hosts: Professors Luciano Castillo and Thomas Siegmund. PIZZA will be provided!