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# International Doctoral Program in Civil and Environmental Engineering

## SEMINAR

### Energy Geo-structures: A Micro- to Macro-scale Perspective

**Prof. Sherif L. ABDELAZIZ, P.E., Ph.D.**

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Environmental Engineering  
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**Location:**

UNIPG Campus of Engineering  
Via G. Duranti, 93, Perugia  
Aula Magna

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**Timetable:**

October 14th 2024 - 11:00 a.m. (CET)

#### Abstract

Climate change has forced the entire world to initiate a global movement towards more utilization of renewable energy sources. One of these easily accessible sources is the shallow geothermal energy, which is present in the top few hundred meters any and everywhere in the world. As civil engineers who support our structures in and on the ground, incorporating this shallow geothermal energy in new and rehabilitated structures became a pressing design request. Fulfilling this request motivates us to understand how temperature changes impacts soil behavior and consequently soil-structure interactions. Towards this goal, this seminar will first focus on a newly developed method to estimate the thermal properties of layered soils, which are needed for assessing the thermo-mechanical soil and soil-structure interactions. We will then discuss how temperature changes impact behavior of soils with special focus on formulating simple relations to estimate thermally induced pore water pressures. We will then dig deeper to the underlying microstructural thermally-induced changes that trigger the observed macroscale thermo-mechanical behavior. Finally, I will discuss the design implications of these findings along with on-going studies to further enhance the design of energy geo-structures.



Prof. Abdelaziz is an associate professor at the Charles E. Via, Jr. Department of Civil and Environmental Engineering at Virginia Tech, where he leads the sustainable geotechnics research group. Prof. Abdelaziz holds a doctoral degree from the Charles E. Via, Jr. Department of Civil and Environmental Engineering at Virginia Tech with an emphasis on Geotechnical Engineering. Abdelaziz's research focuses on multi-scale coupled phenomena in geotechnical engineering including thermo-hydro-bio-mechanical properties of soils and rocks, energy geotechnics, and the use of innovative materials for sustainable geotechnical engineering applications. He has co-authored 100+ publications in peer-reviewed scientific journals and conference proceedings. Prof. Abdelaziz has been awarded several prestigious awards including the 2022 C. A. Hogentogler Award from the American Society for Testing and Materials and the Young Investigator Program (YIP) award from the U.S. Department of Defense. Prof. Abdelaziz has secured more than \$33 million for various federal agencies including the U.S. Army Research Office (ARO), the U.S. Army Corps of Engineers (USACE), the U.S. Department of Homeland Security (DHS), the U.S. Department of Transportation, and the National Science Foundation (NSF) and has been featured by several national and international media including CNN and BBC.

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