VANDERBILT
School *of* Engineering

DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING

Seminar

Friday,

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12:15 pm

FGH 110

"SUSTAINABILITY & AUTOMATION: THE FUTURE OF CONCRETE INDUSTRY"

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ABSTRACT

The construction industry is currently facing many challenges with respect to shortage of skilled workers, greenhouse gas emissions, and our need for massive quantities of construction materials. In this talk I will first focus on this global materials challenge and lay out pathways for achieving sustainability in the cement and concrete industry. These include examples such as the use of mineral waste materials, low-grade calcined clays, and carbonated steel slags. Next, I will focus on advances enabled through automation. Specifically, 3D printing with concrete or additive construction can be a path forward to efficiently use materials and reduce the amount of waste that is generated. Furthermore, robotic construction provides an opportunity to fabricate complex structures such as gyroids. A gyroid is a triply periodic minimal surface that efficiently distributes stress under compression loading in all orientations. Using a 2-component system with an in-house developed flowable mixture and with injection of accelerator at the nozzle, I will demonstrate our ability to print these complex geometries to create and test structural components such as walls.

BIOGRAPHY

Dr. Nair's work focusses on development and characterization of novel cementitious materials. Prior to joining the Civil Engineering department at Cornell University, she worked as a Post-Doctoral Associate at the Cornell High Energy Synchrotron Source (CHESS), investigating the micro-mechanical response of alternate cementitious materials. Previously, she was a Research Associate in the Petroleum Engineering Department at the University of Texas at Austin and worked on improving zonal isolation of oil and gas wells and for decommissioning and permanent abandonment of wells. Dr. Nair received her Ph.D. in Civil Engineering from the University of Texas at Austin and developed a novel set-on-demand concrete based on the principles of magneto-rheology. Her master's degree is from the University of California, Davis and her undergraduate degree is from Indian Institute of Technology Madras. She is a recipient of the American Concrete Institute's Walter P Moore Jr Faculty Award and received an Early Career Fellowship from the National Academy of Sciences, Engineering, and Medicine to improve offshore energy safety.