# The Department of Civil and Environmental Engineering at the University of Houston presents...

## CIVE 6111 Graduate Seminar

## Emerging Technologies for Mitigating Climate Change

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**Friday, March 31, 2023**
**2:45pm-3:45pm**
Classroom Business Building (CBB) - Room 104
Zoom: https://uh-edu-cougarnet.zoom.us/j/94589160391

## Abstract

The last few decades observed a noticeable increase in natural and man-made hazards, including climate change, scarce resources, and increased energy challenges and demands. The continuous upward trend of greenhouse gas emissions demands new developments to mitigate the emissions and create new materials with a low carbon footprint. In civil infrastructure, the frequent occurrence of disasters and the challenges associated with maintaining the performance of critical infrastructure is an issue of great concern for professional societies and policymakers. Over the years, traditional materials and classical design philosophies have proven unyielding to resilient systems and incapable of meeting the challenges to combat climate change. Advancements in materials science and robotics introduced nanotechnology and additive manufacturing, widely known as 3D printing, to infrastructure. This development has created opportunities that were not possible a decade ago. Using such emerging technologies (ETs) appears as a robust solution to mitigate climate change and improve infrastructure resilience.

In this presentation, I will discuss research investigations carried out by my research group at the University of New Mexico on developing a new generation of polymers, polymer concrete, and polymer composites that are nanomodified and/or 3D-printable with superior performance to mitigate climate change. Three distinct categories of ETs with great potential for impacting our efforts to limit global climate events will be identified, namely, smart materials, additive manufacturing technology, and advanced sensing technology. I will showcase recent advancements of select ETs and their roles in new materials developed to minimize the impacts of global warming, including newly invented nanomodified polymers used to seal abandoned oil wells to prevent methane emission, new nanomodified pultruded rebar and 3D-printed composites with improved performance, super ductile textile reinforced polymer concrete, biopolymer concrete with low carbon footprint, and cognizant fiber reinforced polymer (FRP) composites incorporating artificial intelligence components. Additionally, nanomodified composite joints and viscoelastic dampers will be demonstrated as unique structural features that can enhance the resilience of infrastructure during extreme loading events. I will conclude with a roadmap for the current state and field implementation of ETs in the infrastructure and energy sectors.

## Bio

Dr. Mahmoud Reda Taha, PE, is a Distinguished Professor, Regents' Lecturer, and Chairman of the Department of Civil, Construction & Environmental Engineering at the University of New Mexico, USA where he has worked for the past 20 years. He was the founding director of the UNM Resilience Institute. He authored and co-authored more than 370 papers in refereed journals and conference proceedings; he has eleven issued US-Patents and has advised more than 50 students toward their MS and PhD degrees. He is a Fellow of the American Concrete Institute, a Fellow of the American Society of Civil Engineers, Chairman of the ACI Committee on Nanotechnology, Chairman of the ASCE Infrastructure Resilience Division, and Section Editor of ASCE Journal of Materials. He is a licensed professional engineer in the US and Canada, and an entrepreneur. He received his BS (Honors) and MS in Structural Engineering from Ain Shams University, Egypt, and his Ph.D. in Civil Engineering from the University of Calgary, Canada.