Structural Engineering Seminar Series

CEE 595 S

Engineered Earthen Construction: A Promising Sustainable Solution for Climate-Resilient Affordable Housing

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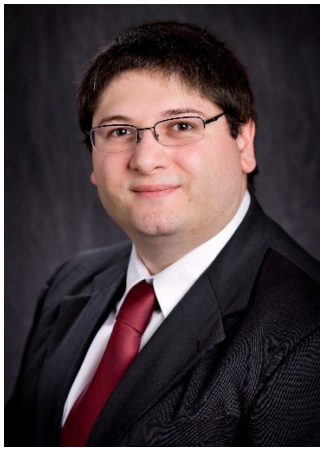
Abstract: A significant portion of the world's population currently lives in earth-based dwellings. Earthen construction provides several advantages over other ordinary housebuilding methods (e.g., fired masonry and wood construction), as it is affordable and locally appropriate, energy and humidity efficient, and environmentally friendly. The need for affordable and sustainable alternatives to traditional housing construction is clear: by the end of this century, due to the expected increase in the world's population and improvement of living conditions, two billion new homes will be needed to meet the future housing demand. Earthen construction dates back over 10,000 years ago, with examples found all over the world. However, traditionally-built earthen structures (i.e., non-engineered cob, rammed earth, or adobe construction) are often inherently brittle and not capable of resisting extreme loads from natural hazards such as earthquakes and strong winds; therefore, they are inadequate for mainstream modern construction. In the last few decades, significant research has been devoted to developing engineered earth blocks as a more affordable and ecologically-friendly alternative to other masonry elements. This presentation will focus on recent and ongoing research on the use of compressed and stabilized earth block (CSEB) construction for affordable and sustainable housing, including a feasibility study for houses in hurricane-prone regions and novel numerical approaches for finite element analysis of earthen masonry. Finally, ongoing research efforts will also be briefly discussed.



Bio:

Dr. Michele Barbato is a Professor of Structural Engineering in the Department of Civil & Environmental Engineering at the University of California, Davis. He is also co-Director of the UC Davis Climate Adaptation Research Center and Director of the CITRIS Climate Initiative. He received his Summa Cum Laude "Laurea" degree in Civil Engineering from the Sapienza University of Rome (Rome, Italy) in 2002, and his M.S. and Ph.D. in Structural Engineering in 2005 and 2007, respectively, at the University of California, San Diego. He is an expert in both traditional and innovative construction methodologies and materials, with particular emphasis on new recycled and green materials. He is active in the development of performance-based methodologies in earthquake, wind, hurricane, and wildfire engineering, as well as in multihazard applications.

He received the 2007 ICASP10 Overseas Student Scholarship, the 2009 ASCE Moisseiff award, the 2011 European Association of Structural Dynamics Junior Research Prize, the ISSE-12 Best Paper Award for Young Experts, the 2020 ASCE Sacramento Section Fredrick Panhost Structural Engineer Award, the 2020 Walter L. Huber Civil Engineering Research Prize, the 2022 Best Paper Award of Research on Engineering Structures and Materials, and the 2023 UC Davis Chancellor's Innovator of the Year Award, as well as numerous teaching and service awards. He was elected SEI Fellow and EMI Fellow in 2019, ASCE Fellow in 2021, and UC Davis Institute of the Environment Environmental Faculty Fellow in 2023. Dr. Barbato has served as the Chair of the ASCE EMI Dynamics Committee in 2017-2020, and of the ASCE SEI Multihazard Mitigation Committee in 2018-2021. Currently, he is the Chair of the ASCE SEI Performance Based Design of Structures Committee and vice-president of EMI.

Monday, April 22nd, 2024 4:00 – 5:20 p.m.

1310 Yeh Student Center