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MSE 690 SEMINAR SERIES

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"Low-Carbon and Affordable Concrete 3D-printed Houses: Opportunities and Research Needs"

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Abstract:

Concrete 3-D printing (C3DP) is an important trending technology for the future of civil engineering construction. It may accelerate the construction process, reduce labor costs, and potentially generate significantly less waste materials. However, C3DP still presents many challenges, such as the uncertainty of the construction costs and the employment of carbon intense materials such as Portland cement. Nevertheless, C3DP could be an important technology for tackling the housing deficit in many locations, both in developing and developed nations. The deployment of C3DP depends on many factors, either political, economic, and technological. Research on this technology is therefore multidisciplinary and must adopt a holistic view. This seminar will present the opportunities of C3DP for the future of civil engineering, as well as the status of the technology worldwide and the challenges ahead. Some important topics covered will be the research needs on low-carbon and affordable materials, the need for multidisciplinary collaboration and academic training, standards and regulations, public policies and public-private partnerships to promote this innovative construction method.

Biography:

Paulo Borges is a Fulbright Scholar (visiting Professor) at Purdue University during the fall term 2024/2025. He is currently an Associate Professor at the Federal Center for Technological Education of Minas Gerais (CEFET-MG), Brazil, where he teaches, research and supervise postgraduate students on sustainable construction materials for Civil Engineering. Paulo received his B.Sc. degree in Civil Eng. (1997) and M.Sc. degree (2002) in Metallurgical and Mining Engineering from the Federal University of Minas Gerais (UFMG), Brazil, and holds a Ph.D. (2007) in Engineering Materials from the University of Sheffield, U.K. He was a visiting professor at Bath University (UK) and University of British Columbia (Canada). Paulo has also industry experience, having worked for international groups in different areas, such as sales, technical services, and R&D related to raw materials (binders, fillers and aggregates) and construction materials (concretes, mortars, fiber cement, plasterboard, high performance insulators and fire-resistant boards). Paulo's special interests are sustainability applied to construction materials, circular economy and open innovation, with current research focused on new alkaline cements, high-performance cement-based composites, mechanical properties, durability and microstructure of low-carbon materials, use of industrial and agricultural residues for affordable low-carbon binders for additive manufacturing (3D printing).

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