Nuclear Engineering Seminar

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3:30 pm | FRNY G140

Digital Engineering for the Future of Nuclear Power: A CROSS-cutting Approach to Safety and Performance

Abstract

Ensuring the safe and efficient operation of nuclear power plants (NPPs)—both existing and next-generation—requires advanced, integrated modeling and simulation capabilities that can address evolving technical, regulatory, and cost-related challenges. In this talk, I will introduce the vision and ongoing efforts of the Crosscutting Research in Operations and Safety of Nuclear Energy Systems (CROSS) group at the University of Tennessee, Knoxville. The presentation will highlight recent and current work on model-data integration using scientific machine learning to support digital engineering initiatives for NPPs. By leveraging expertise in thermal hydraulics, instrumentation and controls, and artificial intelligence, our research aims to improve the performance of safety analysis tools, enable predictive maintenance and intelligent decision support, and accelerate innovation toward a more competitive nuclear power future.

Dr. Xingang Zhao is an Assistant Professor in the Department of Nuclear Engineering at the University of Tennessee, Knoxville (UTK). His research focuses on nuclear systems thermal hydraulics and instrumentation & controls (I&C), with particular emphasis on their intersections with artificial intelligence and decision science. Prior to joining UTK, he was an R&D staff member at Oak Ridge National Laboratory. He earned his Ph.D. in Nuclear Science and Engineering from MIT. Dr. Zhao is the recipient of the 2024 American Nuclear Society (ANS) Ted Quinn Early Career Award. He currently serves on the Executive Committee of the ANS Human Factors, Instrumentation & Controls Division and on the Program Committee of the ANS Thermal Hydraulics Division. He is also the I&C Technical Co-Chair for the upcoming NPIC&HMIT 2025 conference.