MECHANICAL & MATERIAL COLLOQUIUM

Multiphysics Modeling and Simulation for Terrestrial and Space Applications

by Dr. Justin Watson (University of Florida)

Ensuring the safe operation of both existing and new nuclear power plants hinges on rigorous nuclear-reactor safety analysis. Safety analysis quantifies accident consequences and verifies that design margins and control systems will keep any transients within acceptable limits. Multiphysics modeling is central to this effort because a reactor's behavior is governed by the interplay of neutronics, heat transfer, fluid dynamics, structural mechanics, and materials. Numerical simulations that couple these disciplines allow analysts to predict how changes in one domain, say, a loss of coolant flow, affect overall core temperature and fuel cladding integrity. By capturing these cross-field interactions, Multiphysics tools provide a more comprehensive picture of transient and accident scenarios.

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Dr. Justin Watson is an Associate Professor of Nuclear Engineering, Department of Materials Science and Engineering, Herbert Wertheim College of Engineering, University of Florida. He also has a joint appointment with the Idaho National Laboratory. He served in various roles at the Applied Research Laboratory, the Pennsylvania State University, where he earned his PhD, between 2001 and 2018. His expertise covers modeling and simulation of nuclear reactors including safety analysis for a range of reactor types. Since 2018 he has been a member of the faculty at the University of Florida. He recently received the Material Science and Engineering Faculty Excellence in Teaching Award. His research interests include: Reactor Kinetics and Dynamics, Neutronics, Thermal Hydraulics, Multiphysics Simulation, Advanced Numerical Methods, Applied Mathematics, Advanced Code Coupling Techniques, Scientific Software Development, and High-Performance Computing.

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EC 1110

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For questions, comments and suggestions, contact Colloquium Organizers Dr. Saja AL Rifai (salrifai@fiu.edu) or Dr. Jiuhua Chen (chenj@fiu.edu)