NC STATE UNIVERSITY

SOFIA UNIVERSITY
St. KLIMENT OHRIDSKI
EST. 1888

На 30 май 2023 от 13:30 часа в зала B29a ще се състои факултетен семинар на тема:
"Advanced Multi-Physics Multi-Scale Modeling and Simulation Frameworks for Nuclear Reactors"

Лектори:
Prof. Dr. Maria Avramova
and
Prof. Dr. Kostadin Ivanov

North Carolina State University, NC, USA
https://www.ne.ncsu.edu/

Поканени са всички желаещи да се включат присъствено или онлайн.

Линк за online връзка:

Meeting ID:
871 3970 8557

Passcode:
942946

Advanced Multi-Physics Multi-Scale Modeling and Simulation Frameworks for Nuclear Reactors

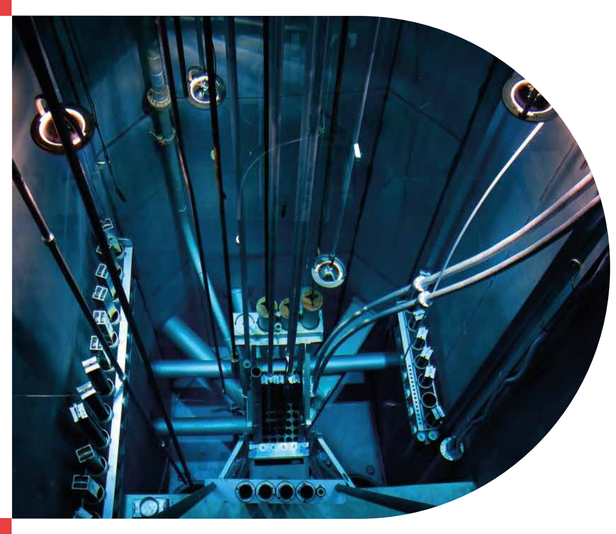
Факултетен семинар.
Физически факултет на СУ "Св. Климент Охридски"

The modeling and simulation (M&S) of nuclear reactors is continuously improving beyond the traditional multi-physics coupling tools. Novel multi-physics tools have recently been developed such as in the U.S. and around the world. These tools, although have impressive capabilities, are very computationally expensive, which limits their applicability to providing reference solutions. This is even more prominent in routine design and safety analyses and uncertainty quantification studies, and this is the reason why traditional multi-physics tools are mainly used.

There is thus a need for High to Low (Hi2Lo) model fidelity information approaches that will expand the usage of novel tools to a larger spectrum of applications and at the same time improve the predictive capabilities of traditional multi-physics tools at a reasonable computational cost. Such need is identified in the industry for easy-to-use, low-cost, fuel-product independent, safety analysis capabilities to facilitate and optimize core reload processes with the ability to consider mixed/transition cores, introduction of ATF assemblies, etc.

In response to those needs, recent developments at North Carolina State University are focused on extending these capabilities into a mature commercial product. Part of these efforts are the introduction of an algorithm to generalize the use of high-fidelity simulations to inform lower-order models for the design, analysis, and licensing of PWRs.

The final product will be applicable to industry for a variety of use cases, from automated fuel reload analysis, safety analyses for plant life extension and power upgrades, introduction of high burnup, higher enrichment and accident tolerant fuel designs. The solution will be applicable to both the operating fleet and emerging LWR-based Small Modular Reactors (SMRs).



The seminar will present consistent Hi2Lo approaches between the different modeling fidelities and for three physics domains within a reactor core: reactor physics, thermal-hydraulics and fuel performance. These different Hi2Lo approaches are integrated into multi-physics frameworks. Uncertainty quantification capabilities are included in the multi-physics frameworks that propagates consistently the uncertainties through the Hi2Lo approaches and allow the computations of sensitivities between multi-physics outputs of interest and the High Fidelity (HiFi) inputs.

This seminar will describe streamlining the application of Hi2Lo procedures to inform the improved use of lower-order models within fast-running design tools. Integrated Uncertainty Quantification Framework (IUQF) is included to identify and propagate input uncertainties across Hi2Lo procedures and to navigate between the different physics domains. The goal is to streamline the core design activities and provide a fuel-technology independent platform to deal with a more flexible operation, consider new loading scenarios (mixed cores) for current and new emerging reactors.

Prof. Dr. Maria Avramova

Dr. Avramova is currently a Professor in the Nuclear Engineering Department at the North Carolina State University (NC State), Director of the Consortium for Nuclear Power at NC State, and Coordinator of the CTF Users' Group. Dr. Avramova is NC State University Faculty Scholar. Dr. Avramova's work has been published in over 180 papers in peer-reviewed journals and proceedings. She has graduated 48 MEng, 24 MS and 20 PhD students. Dr. Avramova is the Co-Chair of OECD NEA Expert Group on Core Thermal-Hydraulics and Mechanics (EGTHM), and currently leads several high-visibility OECD NEA international core thermal-hydraulics and multi-physics benchmarks within WPRS activities.

Prof. Dr. Kostadin Ivanov

Dr. Ivanov is currently a Distinguished Professor and Department Head of Nuclear Engineering at the North Carolina State University (NC State). He was a Distinguished Professor of Nuclear Engineering and Graduate Coordinator of Nuclear Engineering Program at the Pennsylvania State University before joining NC State. Dr. Ivanov's work has been published in over 300 papers in peer-reviewed journals and proceedings. He has graduated 106 MEng, 64 MS and 42 PhD students. Dr. Ivanov is a member of Nuclear Science Committee (NSC) of the Nuclear Energy Agency (NEA), OECD and Chair of Working Party on Scientific Issues of Reactor Systems (WPRS) at NEA, OECD. Dr. Ivanov is ANS Fellow.

Изготвила: Соня Хаммаши