

Nuclear Engineering Seminar

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3:30pm | WALC 1018

Virtual Reactors - Essential Tools for Developing and Operating Advanced Reactors

Abstract

A virtual nuclear reactor is a computerized simulator that can predict the multiphysics behaviors of the target physical reactor with sufficient fidelity and speed. It can be used in the design and/or operation phase of the reactor. In the past, virtual reactors had been developed only for existing reactors for analyzing accident scenarios or performance degradation. In the future, however, they will be used in the design of advanced reactors of various concepts exploiting the high computing power of GPUs and Artificial Intelligence. In addition, digital twins will be used to help the safe and efficient operation of actual reactors. In this seminar, the past accomplishments of virtual reactor development are reviewed first and the prospects of future virtual reactors are then presented.



Dr. Han Gyu Joo has been serving as the President of Korea Atomic Energy Research Institute (KAERI) since December last year. He is on leave from his professorship at Seoul National University where he had served as a Professor of Nuclear Engineering for 18 years. He got his Ph.D. in Nuclear Engineering from Purdue. Before being admitted to the School of Nuclear Engineering, he worked on the nuclear design of the YGN 3&4 nuclear power plants in Korea for 7 years as a KAERI engineer. For this work, he was trained at Combustion Engineering, Inc. during which he learned how to use various neutronics codes. During his time at Purdue including the postdoc period, he studied the methods needed for developing codes and he wrote the initial version of the PARCS (Purdue Advanced Reactor Core Simulator) code which is now being used worldwide through the NRC framework. After returning to KAERI, he led the development of a Numerical Nuclear Reactor based on the DeCART direct whole core calculation code. After moving to SNU, he broadened his expertise in computational reactor physics and developed many neutronics codes as well as a core thermal hydraulics code. He was inducted as a Fellow of the American Nuclear Society in 2015. He is also an inducted member of the National Academy of Engineering of Korea.