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Seminarium Zakładu Energetyki Jądrowej i Analiz Środowiska (UZ3) Departament Badań Układów Złożonych (DUZ)

Wtorek: **01.02.2022**
11:30

dr inż. Piotr Darnowski

Application of genetic algorithms in the design of fuel cycles for a PWR reactor

Abstract:

The presentation will be focused on outcomes of research on the development and application of genetic algorithms to improve reactor core design, fuel cycle performance, and in-core fuel management process in a PWR nuclear reactor. Genetic algorithms are exploratory tools that draw inspiration from basic mechanisms of Genetics and biological Evolution, and they allow to solve complex multidimensional optimization problems in a global manner. Genetic algorithms were implemented in a computational framework coupled with PARCS nodal diffusion core simulator. The Pressurized Water Reactor (PWR) based on the MIT BEAVRS Reactor Physics Benchmark was used as the demonstration case, and developed tools were applied to improve the fuel cycle performance. The main effort was to develop GA dedicated to solving core loading pattern problems with a set of realistic operational constraints and improvement targets. The main effort was put on maximizing the length of the fuel cycle length to make it more economical, but also to limit or control the magnitude of excess reactivity, power profile, power peaking factors, population, and type of fuel assemblies, fissile material mass and inventory of burnable absorbers. Several test simulations were performed, and outcomes will be presented and discussed.

Serdecznie zapraszamy
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