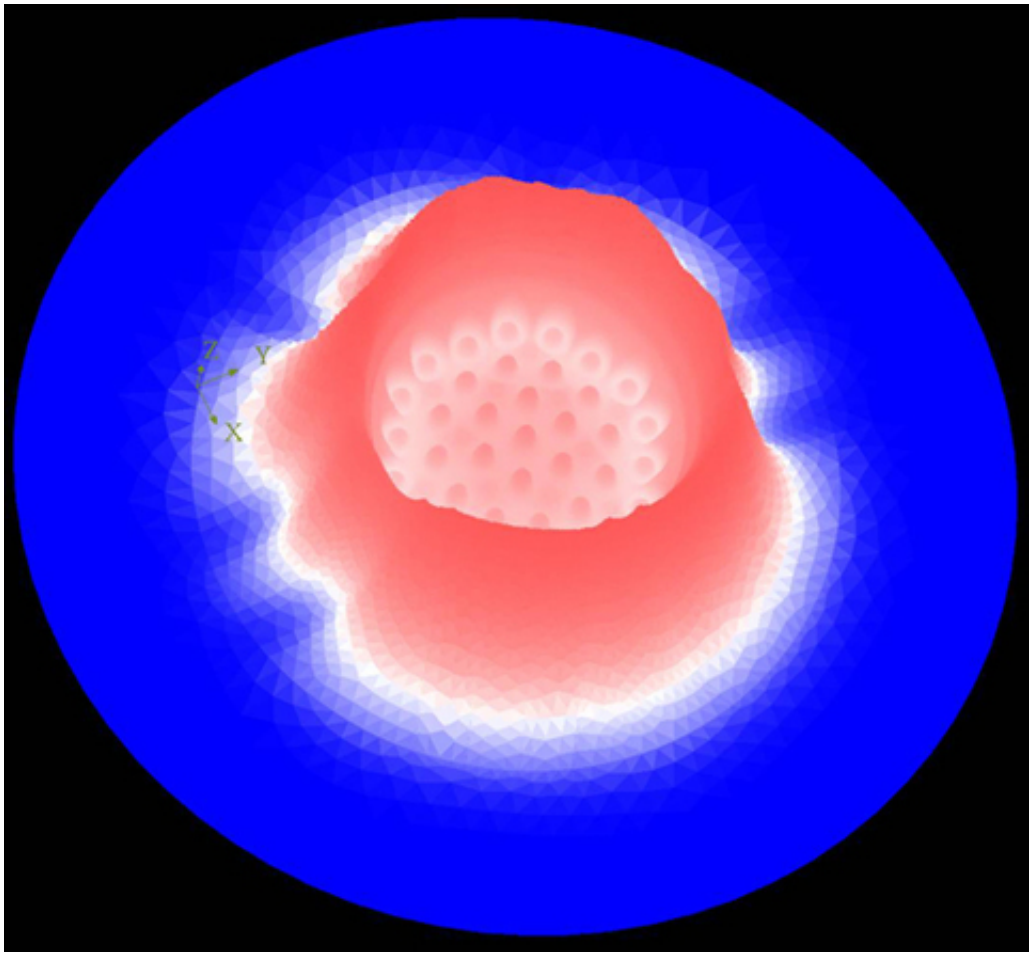
Neutronics for light water reactors: phenomenology

Reference: 835



OBJECTIVES

Sum up the general knowledge in neutron physics requested for design, operation and safety analysis of light water reactors (LWRs):

• identify and explain all the phenomena resulting from neutron-nucleus interactions related to the nuclear reactor behaviour.

PUBLIC

Professionals working in nuclear industry companies, Technical Safety Organizations (TSO) or regulatory bodies, researchers, students.

PREREQUISITES

Mathematical background, especially differential and integral calculation - common functions.

CONTENT

- Introductory nuclear physics: nucleus properties, radioactivity, nuclear reactions, cross-sections, neutron induced reactions, fission reaction and its characteristics.
- Introduction to neutronics: energy domains, neutron current, flux and spectrum, reaction rates; neutron balance: the four factors formula, leakage...
- Diffusion equation: Fick's law, solution of the diffusion equation, one group diffusion theory, critical conditions, “geometrical buckling”.
- Neutron slowing down and thermalization: elastic and inelastic scattering, lethargy, resonance absorption.
- Reactor kinetics: reactivity, prompt and delayed neutrons precursors, Nordheim's equation.
- Temperature and poisoning effects, fuel evolution, Pu recycling.

METHOD

Lectures, exercises. Lab sessions with French computing tools: deterministic code APOLLO2, kinetics and poison softwares.

Maximum number of trainees: 16.

This course includes lab sessions using ionizing radiations and visits of facilities with regulated zones. Please comply with the conditions stated in the terms of sale.

COLLABORATION

Adviser: Cheikh Diop (CEA/DEN/DANS/DM2S/SERMA/DIR)