UCLouvain

lbnen2000

2022

Nuclear reactor theory (Centre d'étude nucléaire-Mol)

6.00 credits		Q2

Language :	English
Place of the course	Autre site
Prerequisites	The following BNEN courses are a prerequisite · Nuclear Energy: Introduction · Introduction to Nuclear Physics and Measurements Mathematics (differential equations, taylor expansions, fourier expansions, bessel functions)
Learning outcomes	**At the end of this learning unit, the student is able to :** • To understand the physical processes involved in a nuclear reactor • To understand and be able to write down and solve the basic equations • To be able to simulate a reactor/source configuration (geometry, composition) as appropriate depending on: - number of dimensions; - steady state or transient; - number of groups; - delayed neutron precursors; - space dependent properties. • To learn how to measure neutron distributions and parameters relevant for nuclear reactors, in particular reactivity and reactivity coefficients
Evaluation methods	Written examination, open book.
Content	• Physics of nuclear reactors • Transport and diffusion • Spatial dependence • Slowing down theory • Resonance integrals • Cell calculations • Neutron thermalisation • Multigroup equations • Criticality dependence on geometry and composition • Reactivity and control • Reactor dynamics • Reactor codes • Neutron sources and detectors • Basic measurements: source strength, neutron flux (activation analysis, neutron counting), neutron spectrum reaction rates • Activity, dose and cross-section measurement • Measurement of neutron transport parameters: stationary methods, pulsed neutron experiments • Measurement of reactivity (and reactivity coefficients): survey, static methods, dynamic measurements, inverse kinetics, neutron noise fluctuation methods
Other infos	This course is part of the Advanced Master programme in nuclear engineering organized by the Belgian Nuclear Higher Education Network (BNEN). BNEN is organised through a consortium of six Belgian universities and the Belgian Nuclear Research Centre, SCK-CEN and takes place at the SCK-CEN in Mol. Information : https://www.sckcen.be/fbnen
Faculty or entity in charge	EPL

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Advanced Master in Nuclear Engineering	GNUC2MC	6		